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Analysing and evaluating flood risk governance in England –

Enhancing societal resilience through comprehensive and aligned flood risk governance arrangements

Alexander, M., Priest, S., Micou, A.P., Tapsell, S., Green, C., Parker, D., and Homewood, S.

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Preface

This report is the third deliverable of the EU 7th Framework Project STAR-FLOOD (www.starflood.eu). STAR-FLOOD focuses on flood risk governance. The project investigates strategies for dealing with flood risks in 18 vulnerable urban regions in six European countries: England (UK), Belgium, France, The Netherlands, Poland and Sweden. The project assesses Flood Risk Governance Arrangements from a combined public administration and legal perspective, with the aim to make European regions more resilient to flood risks.

Work Package 1 provided an extended problem analysis related to Flood Risk Governance in Europe and Work Package 2 focused on how Flood Risk Governance in Europe can be researched. Work Package 3 forms the empirical core of the project, in which analysis, explanations and evaluations of each country, including three case studies, have been performed¹. This report constitutes deliverable D3.3 and summarises the research conducted in England (UK) at the national and case study level of analysis; including the case studies of Kingston-upon-Hull (North East England), the Lower Thames (South East England) and the City of Leeds (North England). In contrast to other Partner countries, flood risk governance in England is characterised by its complexity and comprehensive approach to flood risk management. There are considerable strengths of this system in terms of enhancing societal resilience to flooding, resource efficiency and the legitimacy of flood risk governance.

This report accompanies five other reports for each partner country (D3.2 to D3.7). Alongside D3.1, a report of workshops held in each country, these deliverables form the main input for the last two Work Packages of STAR-FLOOD; WP4 and WP5. Whereas WP4 focuses on a systematic comparison between the STAR-FLOOD consortium countries; WP5 identifies design principles for appropriate and resilient Flood Risk Governance.

We trust that the current report is of interest for a broad readership with an interest in Flood Risk Management and governance. The content of this report may inspire researchers and professionals with an interest in social scientific and legal research into Flood Risk Management, Disaster Risk Reduction or climate change adaptation.

Yours sincerely,

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Leader of WP3

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¹ Other deliverable reports for each country are as follows; The Netherlands (D3.2); Belgium (3.4); Sweden (3.5); Poland (D3.6); France (D3.7)

Overview of key findings

1. Main characteristics of flood risks in England

Flooding has been identified in the National Risk Register and UK Climate Change Risk Assessment 2012 as a significant current and future risk in England (HM Government, 2012a). According to the National Flood Risk Assessment (NAFRA), one in six residential and commercial properties are at risk from fluvial, coastal or surface water flooding (excluding current defences in place). Although there are methodological challenges and uncertainties in risk estimation (Penning-Rowsell, 2015), national policy is guided by the NAFRA approach. Flood risk is exacerbated by a range of factors, such as land use change (including urbanisation), population growth, aging drainage infrastructure and natural processes (*e.g.* erosion and subsidence). Furthermore there is mounting evidence that flood risk will increase under scenarios for climate change (Evans *et al.*, 2004; 2008; Ramsbottom *et al.*, 2012). Flood Risk Management (FRM) is thus rising on the political agenda.

It is widely recognised that flood prevention through defence networks is not feasible for every at-risk location; rather social, economic and environmentally sustainable FRM requires a portfolio of structural and non-structural solutions to minimise the adverse, tangible and intangible consequences of flooding (Defra, 2005; Defra/EA, 2011a). In contrast to other European countries, a diversified and holistic approach to FRM has been established for ca.65 years in England. A range of FRM measures (FRMMs) have been consistently applied, but have arguably diversified within certain strategies in recent years; such as encouraging the uptake of property-level measures and community flood action plans to enhance strategies of *mitigation* and *preparation and response* (Defra/EA, 2011a; Table ES1).

Table ES1: Some of the current measures employed in FRM, England

Flood Risk Management Strategies (FRMSs)	Flood Risk Management Measures (FRMMs)
Prevention This strategy aims to minimise people's <i>exposure</i> to flooding, this is achieved via measures that keep people and property away from water.	<ul style="list-style-type: none">▪ Spatial planning to influence location and layout of future development. The <i>sequential test</i> is a mechanism to reduce development on the floodplain.▪ Multi-functional land use <i>i.e.</i> space is designated for several purposes (<i>e.g.</i> a park may also function as a flood storage area and is expected to flood during heavy rainfall)
Defence This strategy aims to minimise the <i>likelihood and/or magnitude</i> of flooding, via measures that keep water away from people <i>i.e.</i> measures that act to <i>resist</i> water.	<ul style="list-style-type: none">▪ Tidal surge Barriers and sluices▪ Embankments▪ Flood walls▪ Conveyance engineering (<i>e.g.</i> dredging)▪ Demountable defences
Mitigation This strategy aims to minimise the <i>likelihood and/or magnitude of flooding</i> , via measures that <i>accommodate</i> water.	<ul style="list-style-type: none">▪ Flood storage areas / retention basins▪ Natural flood management measures <i>e.g.</i> peatland restoration, wetland creation, tree planting and restoration of riverside corridors▪ Managed realignment

Flood Risk Management Strategies (FRMSs)	Flood Risk Management Measures (FRMMs)
	<ul style="list-style-type: none"> ▪ Property <i>resistance</i> and <i>resilience</i> measures ▪ Green roofs ▪ Living walls ▪ Permeable pavements ▪ Designated floor heights above flood level
<p>Preparation & Response</p> <p>This strategy aims to minimise the <i>consequences</i> of flooding via measures that strengthen societal capacity to prepare and respond to a flood event.</p>	<ul style="list-style-type: none"> ▪ Flood forecasting ▪ Range of communication methods for disseminating flood warnings (<i>e.g.</i> Floodline warnings Direct service; local flood wardens) ▪ Targeted flood warning service for infrastructure ▪ Emergency management ▪ Promoting risk awareness amongst organisations and the public ▪ Community flood action plans ▪ Promoting activities at the household scale (<i>e.g.</i> property <i>resistance</i> and <i>resilience</i> measures)
<p>Recovery</p> <p>This strategy aims to minimise the <i>consequences</i> of flooding via measures that seek to strengthen societal capacity to recover from a flood event.</p>	<ul style="list-style-type: none"> ▪ Private market insurance ▪ Bellwin Scheme ▪ Local Authority to support community recovery post-flood ▪ Involvement of voluntary sector (<i>e.g.</i> National Flood Forum)

2. Main characteristics of the Flood Risk Governance Arrangement (FRGA)

On the basis of extensive policy and legal analysis of key documents, over 60 interviews and two workshops with key actors in FRM, this report summarises the main findings from research conducted into flood risk governance in England. Analysis has been conducted at the national scale, with a focus on fluvial and surface water FRM. This was accompanied by in-depth research in three case studies, each selected to reveal insight into different aspects of flood risk governance;

- **Kingston-upon-Hull and the Hull and Haltemprice catchment** – *Exploring efforts to integrate surface water mitigation within a defence-reliant regime* (Alexander *et al.*, 2015a)
- **The Lower Thames and the River Thames Scheme (RTS)** - *Exploring the implementation of a multi-scale flood risk management scheme within the context of Partnership Funding* (Micou *et al.*, 2015a)
- **The City of Leeds** - *Balancing flood risk with economic development through localised cooperation and innovative measures* (Alexander and Priest, 2015)

This research provides a comprehensive analysis of the actors, rules, resources and discourses that structure the National Flood Risk Governance Arrangement (FRGA). Within this arrangement, eight sub-arrangements deliver distinct goals (Figure ES1) and further reflect different modes of governance; with evidence of centralised, decentralised, public-private, self-governance and interactive governance. Bridging mechanisms and processes facilitate interactions between these sub-arrangements. This report argues that the characteristic complexity of flood risk governance in England is necessary and supports the delivery of diversified, multi-scale approaches to FRM.

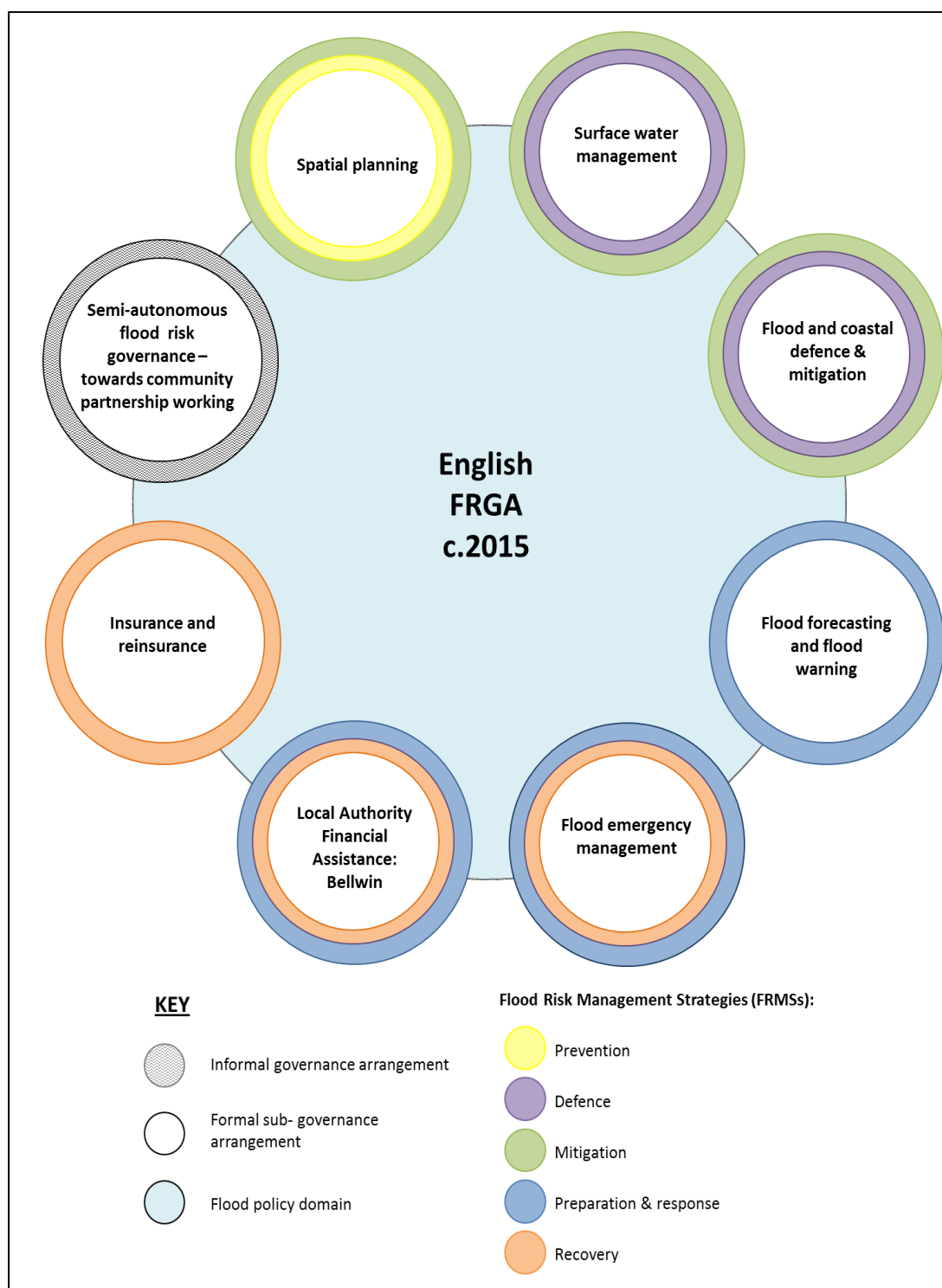


Figure ES1: The national Flood Risk Governance Arrangement (FRGA) in England, 2015.
{Note: Each sub-FRGA represents a distinct arrangement of actors, rules, resources and discourses related to key goals in FRM. These sub-arrangements are related to one or more FRM Strategies}

3. Explanations for stability and change

To explain how and why flood risk governance has adopted its current form, this research has performed an in-depth analysis of past governance dynamics and examined the factors driving change and stability. Flood risk management has a long legacy in England and is characterised by long periods of stability and incremental change (rather than abrupt departures from the past). Significant changes in flood risk governance tend to be driven by *exogenous factors*, such as shifts in political ideology (e.g. centralisation, privatisation and localism). In contrast, factors leading to stability as well as incremental change are generally *endogenous* to the flood policy domain, such as so-called ‘catalyst’ flood events. Different orders of change are evident, for instance, the implementation of the EU Floods Directive 2007/60/EC provided greater support to existing practices.

The dominance of incremental change is indicative of the way that flood risk management has developed in England over a long period of time and is seen as a fundamental strength of the approach, providing the flexibility to respond quickly to challenges. As flood risk management in England has matured, the system has become highly stable and there has been a general formalisation of flood risk governance arrangements and increasing professionalism in FRM. Coupled with this, flood risk governance has become more complex, leading to greater overlaps with other policy domains, increasing number of rules and actors, leading to mixed modes of governance. In turn, there has been more alignment and coordination between sub-FGRAs within an increasingly comprehensive national arrangement. Importantly, changes to flood risk management in England do not always require a significant change in governance.

4. Evaluation of resilience, efficiency and legitimacy

STAR-FLOOD adopts a normative position that flood risk governance should i) enhance societal resilience to flooding (including the *capacity to resist*, the *capacity to absorb and recover* and the *capacity to adapt*), ii) make use of resources in an efficient way and ii) should be considered to be legitimate. In-depth analysis was performed at the national scale and triangulated through case study research.

To what extent does flood risk governance enhance societal resilience to flooding?

Flood risk governance underscores the delivery of flood risk management, from policy and legislation through to its implementation, and the assembly of strategies and measures to manage flood risk. Governance therefore plays a pivotal role in supporting (or potentially constraining) societal resilience to flooding. In England, flood risk governance influences societal resilience in the following ways:

- I. Diversification of FRM measures and strategies enables holistic FRM in England. This supports societal resilience by enhancing the capacity to resist flooding, as well as absorb and recover from flood events when they occur.
- II. The capacity to resist is enhanced by defence infrastructure and supported by the national Investment Plan and Partnership Funding; however, the prioritisation approach for allocating revenue spending to maintain existing defences means the capacity to resist flooding may diminish in some areas.

- III. There have been considerable efforts to strengthen flood risk governance for surface water flooding following the Summer floods in 2007 and to enhance the capacity to resist this type of flood event. Sustainable Urban Drainage Systems (SUDS) are now embedded within spatial planning but it is too soon to evaluate the impact of this.
- IV. The exposure of people and property is minimised through spatial planning mechanisms (*i.e.* the Sequential Test and Exception Test) and planning conditions. This supports the capacity to resist, or absorb and recover should flood events occur. However, development on the floodplain is continuing. More needs to be done to ensure that future development is resilient and adaptive to changes in flood risk.
- V. Flood forecasting, warning and emergency management is exceptional and has instilled significant capacity to absorb and recover from flood events.
- VI. Considerable efforts have been made to engage local communities in FRM, increase awareness of flood risk and encourage adaptive behaviours (*e.g.* installation of property level resistance and resilience measures); both to enhance the capacity to absorb and recover, as well as adapt to future flood risk. Whilst there are examples of success (*e.g.* Defra Pathfinder projects), expectations amongst some groups appear to be at odds with national policy.
- VII. Financial recovery mechanisms enhance the capacity to 'bounce back', but more should be done to encourage adaptation rather than a return-to-normal model of resilience.
- VIII. Adaptive capacity is cultivated through i) cultures of institutional learning, ii) knowledge exchange at the scientific-policy interface, iii) adaptive management approaches in the delivery of flood defence measures and iv) forward planning for future risk and climate change. However, continued efforts are required to enhance adaptive capacity at the household and community scale, and normalise adaptation within society.

To what extent can flood risk governance be described as efficient?

Efficient flood risk governance is desirable, especially as FRM is largely funded by the public sector and therefore subject to resource constraints. Making the best use of resources (economic, human and technological) is necessary for enhancing the effectiveness and sustainability of FRM. Efficiency is both supported and constrained by flood risk governance in the following ways:

- IX. The allocation of capital and revenue spending via Cost-Benefit Analysis (CBA), whole-life costing and risk-based prioritisation encourages long-term cost-effectiveness and economic efficiency.
- X. Partnership Funding has the potential to lessen the financial burden on the State. However at this point in time, Partnership Funding has predominantly resulted from the redistribution of public money rather than private sector contributions.
- XI. Resource efficiencies have been created through institutional restructuring and duties for cooperation between Risk Management Authorities and other professional actors.
- XII. The potential to apply cross-sectoral Catchment-Based Approaches (CaBA) currently encouraged in water and environmental policy is debated in FRM. Further evidence is required to demonstrate the effectiveness of this approach for alleviating flood risk and its potential for maximising the efficient use of resources.

To what extent can flood risk governance be described as legitimate?

Ultimately flood risk governance should be conducted in a legitimate way. This assessment was operationalised via several criteria, including *social equity, accountability, transparency, participation, access to information, procedural justice* and *acceptability*. The legitimacy of flood risk governance can be summarised as follows:

- XIII. The distribution of flood risk is inherently unfair, but there are mechanisms in place to support social equity and deliver fair flood risk management in terms of the distribution of resources and provision of flood insurance.
- XIV. Procedural equity and access to procedural justice is delivered in flood risk governance arrangements in England.
- XV. Transparency and accountability in flood risk governance is enhanced by independent reviews and public scrutiny of FRM and responses to significant flood events. There is a need to exercise caution to ensure that this does not create a ‘scrutinising culture’ that unfairly attributes blame.
- XVI. Public consultation and participation is well established and growing in momentum in flood risk governance in England.
- XVII. Flood risk information is publically available; this enhances transparency in flood risk governance, as well as raising public awareness of flood risk and management decisions.
- XVIII. Public acceptance of flood policy at the national scale is constrained by poor understanding of flood risk, and the permissive powers of Risk Management Authorities, amongst *some* groups in society. There is a need to better communicate the ‘living with water’ philosophy and the necessity of diverse approaches in order to deliver social, economic and environmentally sustainable FRM.

Overall, this research highlights a considerable number of strengths and ‘good practices within flood risk governance, through which effective flood risk management is delivered. However, there are some aspects of governance that could be strengthened.

5. Good practices, options for improvement and recommendations

Based on this comprehensive analysis, this report proposes some key recommendations for strengthening flood risk governance in England.

RECOMMENDATION 1: Enhancing the capacity to resist flooding requires *both* a long-term commitment of capital and revenue spending to support new projects and the maintenance of existing assets. The national Investment Plan is a significant step-change in the allocation of capital investment. Since the time of data collection and analysis the Treasury has released the *Spending Review and Autumn Statement 2015*, which also protects the budget for defence maintenance until 2021. This is an important step-forward in securing revenue for asset maintenance in the medium-term. We recommend the continuation of a 6 year spending programme (once the current Investment Plan is delivered in 2021), which gives equal consideration to capital and revenue funding from the outset.

RECOMMENDATION 2: Partnership Funding holds significant potential to increase the number of defence and mitigation projects developed by diversifying funding sources and creating risk-sharing arrangements between the public and private sectors and civil society. There is a need to establish a

strategy to incentivise the private sector, in case the anticipated funding from the private sector falls short. This strategy should take into account the different interests and motivations (e.g. beneficiary, branding and notion of corporate responsibility), for which further research is required, and consider different types of incentives.

RECOMMENDATION 3: Continued alignment of FRM with other policy goals (such as economic development and re-generation), is necessary for diversifying funding sources for FRM activities. However, there is a need to develop methods for performing cross-sectorial Cost-Benefit Analysis to examine these wider benefits and facilitate access to wider funding streams. Whilst there is considerable potential to deliver multiple benefits (e.g. environmental, economic, recreational etc.) through integrated, cross-sectoral Catchment Based Approaches (CaBA), there is a lack of evidence that this approach could lead to significant reductions in flood risk. Therefore, further empirical research is required to demonstrate the potential of CaBA in FRM, to reduce current uncertainties and to develop long-term monitoring techniques (as requested by others e.g. McIntyre and Thorne, 2013).

RECOMMENDATION 4: Effective flood risk management can be partly-delivered through better spatial planning. However, there is a need to strengthen enforcement mechanisms to ensure that planning decisions taken today do not simply circumvent risks in the future. Risks should not only be passed to homeowners, but those undertaking (and profiting) from development should also retain some responsibility and liability. Secondly, more needs to be done to integrate and retrofit Sustainable Urban Drainage Systems (SUDS) into urban centres. This is largely the responsibility of property owners, such as domestic, commercial and public properties; therefore, incentives for promoting SUDS must be directed at various property owners (CIWEM, 2013). This should be accompanied by national and local initiatives to promote SUDS retrofitting and inclusion within urban centres. The creation of ‘SUDS champions’ within Risk Management Authorities could facilitate the delivery of this vision at the local scale.

RECOMMENDATION 5: The Flood Reinsurance scheme (“Flood Re”) is an important stop-gap measure to ensure the availability and affordability of flood insurance. However, the insurance industry should take a more proactive role in promoting the uptake of property-level risk reduction measures. In the transition towards risk-reflective pricing, there is a need to establish a strategy for incentivising policyholders to invest in risk reduction measures; this should include plans to increase risk awareness and clarify how household *flood risk reports* will be rewarded.

RECOMMENDATION 6: Since the time of data collection and analysis, the government has released the *Spending review and Autumn Statement 2015*, as well as the *Provisional local government finance settlement 2016-2017*, which outlines reforms to local government funding. These changes will reduce dependency on central government grants and mean that councils will be fully-funded through local sources of revenue. The impact of these funding reforms upon local FRM is an unknown, but is likely to vary significantly across the country. These funding reforms could have serious implications for local investment in FRM activities. Therefore, we recommend that in the transition period for implementing these reforms a formal review process is established to explicitly monitor both positive and negative implications and knock-on effects for FRM spending.

RECOMMENDATION 7: Community engagement is essential for enhancing risk awareness and ownership of risk responsibility at the local scale; however, resource constraints in the LLFAs and the EA constrain the delivery of this essential work. There is a need to increase resources (financial, staffing and skills) to support public engagement activities that are rooted in local concerns in order to enhance sustainability.

RECOMMENDATION 8: There is a need to better manage societal expectations, improve public understanding of flood risk and risk responsibilities, and enhance acceptance of the risk-based, ‘living with water’ philosophy advocated in flood policy in the pursuit of sustainable FRM. This is necessary to empower individuals to adopt adaptive behaviours (*e.g.* implementation of property-level measures). However, this can be constrained by inconsistencies in risk communication messages provided by different RMAs. Therefore, we recommend that efforts are made, from national to local scales, to establish consistent, user-friendly information about flood risks and FRM across Risk Management Authorities. Moreover, this should be echoed by public-facing actors and reactive political ‘knee-jerk’ reactions following flood events (*e.g.* Winter 2013/14) should be avoided, as these undermine FRM policy as well as setting precedents that cannot be sustained. Public-facing actors and politicians should provide greater support for the FRM approach adopted in England, especially given the considerable strengths and examples of best practice embedded within it.

Abbreviations

ABI	Association of British Insurers
CBA	Cost-Benefit Analysis
CCA 2004	Civil Contingencies Act 2004
CCA Regulations 2005	Civil Contingencies Act 20004 (Contingency Planning) Regulations 2005
CCA 2008	Climate Change Act 2008
CCC	Committee on Climate Change
CCS	Civil Contingencies Secretariat
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information Association
CoBRA	Cabinet Office Briefing Room A
DCLG	Department of Communities and Local Government
Defra	Department for Environment Food and Rural Affairs
DETR	Department of the Environment, Transport and the Regions
DTLR	Department for, Transport, Local Government and the Regions
EA	Environment Agency
Efra	Environment, Food and Rural Affairs Committee
FAS	Flood Alleviation Scheme
FRGA	Flood Risk Governance Arrangement
FRMMs	Flood Risk Management Measures
FRMSs	Flood Risk Management Strategies
FRR 2009	Flood Risk Regulations 2009
FWMA 2010	Flood and Water Management Act 2010
GFC 2007/8	Global Financial Crisis of 2007 to 2008
LA	Local Authority
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum
MAFF	Ministry of Agriculture, Fisheries and Food
NFM	Natural Flood Management
NAFRA	National Flood Risk Assessment
NFF	National Flood Forum
NRA	National Rivers Authority (the precursor to the Environment Agency)
ODPM	Office of the Deputy Prime Minister
Pitt Review	Independent Government Review into the 2007 floods led by Sir Michael Pitt
RMAs	Risk Management Authorities (as identified under the Flood and Management Act 2010)
SAB	SUDS Approving Body
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SOP	Standards of Protection
Sub-FRGA	Sub-Flood Risk Governance Arrangement
SUDS	Sustainable Urban Drainage Systems
SWMP	Surface Water Management Plans
uFMfSW	updated Flood Map for Surface Water

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1 Introduction

1.1 Introducing flood risk governance in England

Flood risk governance in England is characterised by its complexity and comprehensive approach to flood risk management. As governance has evolved through incremental changes, there have become greater overlaps with other policy domains, an increasing number of rules and broadening of actors, which has resulted in mixed modes of governance. In line with this, there has been increasing emphasis on local scale FRM, community engagement and empowerment, cost-sharing arrangements and partnership working (Defra, 2011a; Defra/EA, 2011a; Nye *et al.*, 2011). The need to develop Natural Flood Management (NFM) and increase the uptake of property-level measures has been stressed more recently to complement the existing diverse portfolio of measures enacted in England (Pitt, 2008; Defra/EA, 2014b).

This research provides the first comprehensive analysis of flood risk governance in England. Our findings are based on in-depth policy and legal analysis of key documents, over 60 interviews and two workshops with key actors in FRM (see Annex, Table A1). Analysis has been conducted at the national scale and accompanied by three in-depth case studies; Kingston-upon-Hull (North East England), the Lower Thames (South East England) and the City of Leeds (North England). This research involved an in-depth analysis of governance dynamics and the factors steering change and stability in flood risk governance, dating back to the 1930s. Accompanying this, flood risk governance has been evaluated in terms of its impact on societal resilience to flooding, its efficiency and legitimacy. This report reflects on the strengths and weaknesses in the current approach to FRM and provides a number of recommendations for strengthening flood risk governance.

1.2 Research aims and questions

The STAR-FLOOD Project (www.starflood.eu) focuses on flood risk governance and investigates how current **Flood Risk Governance Arrangements (FRGA)** can be strengthened or redesigned to enhance societal resilience to flooding in urban areas. A FRGA is defined within this project as the arrangement of actors, rules, resources and discourses united under the shared goal of Flood Risk Management (FRM). Within this national arrangement, sub-arrangements (referred to here as **sub-FRGAs**) are discernible through distinct arrangements of actors, rules, resources and discourses directed towards a distinct goal of FRM. For instance, spatial planning aims to minimise the exposure of people and property to flood risk. Both units of analysis are examined within this research.

The extent to which governance arrangements support or constrain the diversification of **Flood Risk Management Strategies (FRMSs)** is assessed according to the strategies of *prevention, defence, mitigation, preparation and response, and recovery* (Figure 1.1). These strategies address different aspects of the risk equation (exposure, hazard and consequences). *Prevention* includes those measures that minimise the exposure of people/property to flood risk (*e.g.* through planning conditions). *Defence* and *mitigation* strategies minimise the likelihood and/or magnitude of the flood hazard through the use of measures that either act to resist (*e.g.* flood wall) or accommodate water (*e.g.* flood storage), respectively. Finally, *preparation and response* and *recovery* strategies serve to

lessen the consequences should a flood event occur. By examining these, we test our starting assumption that diversity is necessary for societal resilience (Priest *et al.*, 2013; Hegger *et al.*, 2014).



Figure 1.1: Overview of the five Flood Risk Management Strategies identified within STAR-FLOOD

This document summarises the main outcomes of policy and legal analysis conducted at the National Flood Policy and Regulation Domain (NFPRD) in England. The NFPRD embraces all flood-related policies and legislation, as well as the interaction between relevant policy domains at the national scale; therefore, this involves an assessment of vertical and horizontal forms of governance (Larrue *et al.*, 2013; Green, 2014). This is examined further through three selected case studies: Namely the City of Kingston-upon-Hull and the Hull and Haltemprice catchment; the City of Leeds; and the River Thames Scheme (RTS) located in the Lower Thames area. Box 1.1 lists the research questions that are being addressed in this report.

Box 1.1 Research Questions addressed in Work Package 3 in STAR-FLOOD

National level research questions

1. How is the national Flood Risk Governance Arrangement (FRGA) structured? To what extent is there cohesion between sub-FRGAs?
2. To what extent are the five Flood Risk Management Strategies embedded in the national FRGA? Is there evidence to suggest efforts are being made to diversify FRMSs and FRMMs employed within these strategies?
3. How has the national FRGA changed over time? What explanatory factors account for periods of stability and/or change?
4. To what extent does the current national FRGA support societal resilience to flooding?
5. To what extent does the national FRGA make use of resources (financial, human and technological) in an efficient way?
6. To what extent can the current FRGA be characterised as legitimate?

Case study research questions

7. To what extent do the governance arrangement(s) in selected case studies reflect those evident in the National Flood Policy and Regulation Domain?
8. To what extent are the five FRMSs embedded in the governance arrangement(s) in selected case studies?
9. How have arrangements for flood risk governance evolved over time? What are the driving forces for stability and/or change? In what ways do these compare to those seen at the national scale?
10. To what extent can the governance arrangement(s) in selected case studies be characterised as *resilient*, *efficient* and *legitimate*?
11. To what extent do the governance arrangement(s) in the NFPRD enable or constrain innovative initiatives in selected case studies?

1.3 Research approach and methods

The empirical research conducted at national and case study scales comprised a series of stages (illustrated in figure 1.2) and summarised as follows;

1. **Identification** of the national Flood Risk Governance Arrangement (FRGA) and sub-FRGAs, according to the arrangement of actors, rules, resources, discourses in relation to functionality;
2. **Explanation** of governance dynamics, including explanatory factors for stability and change;
3. **Evaluation** of flood risk governance according to the desired outcomes of *resilience*, *efficiency* and *legitimacy* (based on the framework presented by Alexander *et al.*, 2015b);
4. **SWOT analysis** – including an assessment of the strengths and weaknesses in current flood risk governance, as well as the opportunities and threats to strengthening flood risk governance in England.

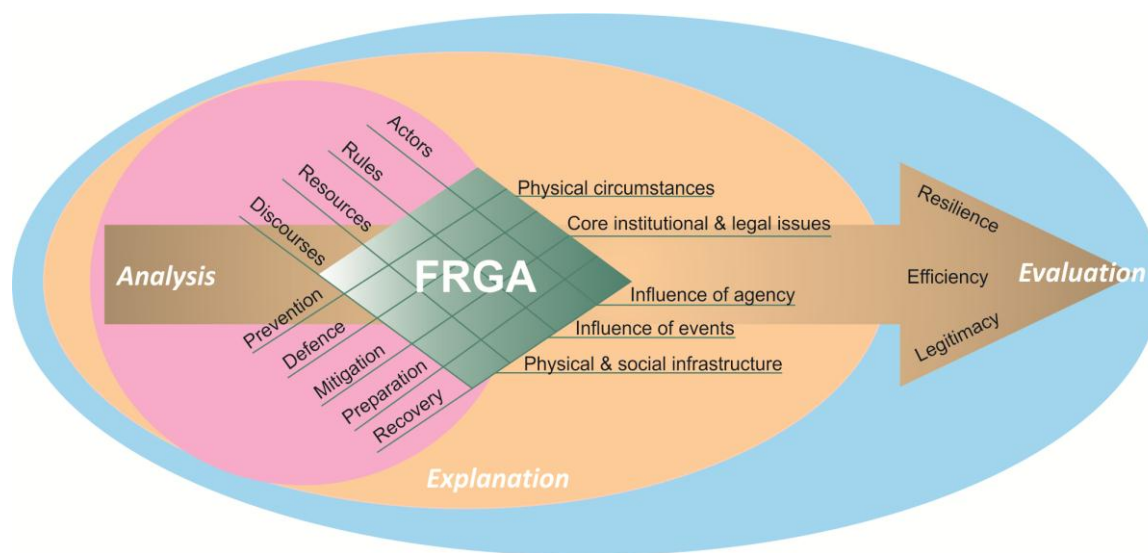


Figure 1.2: Research steps in STAR-FLOOD

To support identification and analysis of the FRGA and sub-FRGAs, we adopt the **Policy Arrangement Approach (PAA)** as an analytical framework based on the four interdependent dimensions of *actors*, *rules*, *resources* and *discourses* (Arts *et al.*, 2006). Originally, this framework was developed to facilitate analysis of policy arrangements, though is extended in this project to governance arrangements more broadly. Application of the PAA sought to satisfy a number of objectives, facilitated through a number of research questions:

- i. To guide the empirical focus of methods for data collection and analysis, and integrate research findings obtained via policy and legal perspectives;
- ii. Provide a framework to identify and characterise governance arrangements;
- iii. To identify the presence or absence of dynamics in FRGAs (see operationalization presented in Larrue *et al.*, 2013);
- iv. To support evaluation and Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis.

A mixed methods strategy was adopted to address the research questions outlined in box 1.1. Firstly, key documents were *purposely sampled* to examine these research questions (May, 2001); this included all policy and legal documentation related to different FRM activities (including the FRMSs, figure 1.1) and the dimensions of the PAA (as listed in box 1.2). This was accompanied by semi-structured interviews with key actors with responsibilities in FRM or identified experts in this field (purposely sampled). A total of 29 interviews were conducted at the national scale and 32 interviews at the case study scale. A full list is provided in the Annex (Table A1). The decision to adopt a purposive sampling strategy was justified by the “*fit for purpose*” criterion, *i.e.* these documents and selected interviewees were deemed best placed to answer the research questions of this study (May, 2001). As a result, the number of interviewees varies between different aspects of flood risk governance at the national scale, and between case studies.

Box 1.2: Documents subject to policy and legal analysis

- Primary legislation (statute law) *i.e.* Acts of parliament
- Secondary legislation (delegated legislation) *i.e.* statutory instruments such as Regulations
- Informal rules *i.e.* Guidance, Circulars and Codes of Practice
- National case law
- European and international legislation and legal instruments, where they are deemed relevant for understanding FRGAs
- Policy documents and briefing reports

For the evaluation component of this research several sources of data were used (box 1.3). Accompanying this mixed methods approach, two workshops were also convened. The first was held in November 2013 with two leading academics in the field of FRM research and a semi-retired senior actor within the Environment Agency. In addition a knowledge exchange event was held in April 2015 in which a range of flood risk professionals participated (reported in Micou *et al.*, 2015b).

Box 1.3: Sources of data for evaluation

- Interviews with professionals and long-standing academics in the field of FRM
- Data from the Environment Agency *e.g.* post-flood event surveys related to flood warning and actions taken
- Data from Local Planning authorities
- Flood defence spending figures
- Freedom of information requests regarding the effectiveness of planning instruments
- Published independent reviews of significant flood events (*e.g.* Summer floods 2007, Winter floods 2013/14) and relevant statistics
- Investing in Britain’s future (treasury report)
- Recently published National Infrastructure Plan
- Impact Assessments (IA) of key legislation
- Policy analysis

A range of analytical methods were employed to assess these data. This included contents and discourse analysis (Graneheim and Lundman, 2004; Liefferink, 2006; Wiering and Arts, 2006); legal analysis (including historical, positive and comparative law); grounded theory (Charmaz, 2006); and institutional and stakeholder mapping. A difficulty with this type of longitudinal research is identifying an appropriate baseline date and balancing the need to be pragmatic whilst identifying a cut-off point that is meaningfully informed and relevant for understanding the governance

arrangement under study. In England, change and stability is witnessed at different points in time within each sub-FRGA, therefore a range of baseline dates were used to inform our analysis (table 1.1). These dates were identified from policy and legal analysis, as well as confirmed through interviews and an expert workshop. Each sub-FRGA and their distinct arrangements of actors, rules, resources and discourses, are described in turn in Section 2.3.

Table 1.1: Baseline dates for analysing dynamics within sub-FRGAs in England

Sub-FRGA	Baseline date
Spatial planning	1992
Fluvial and coastal defence and mitigation	1930
Surface water flood management	1989
Forecasting and flood warning	1960
Flood emergency management	1935
Insurance and reinsurance	1920
Local Authority financial recovery: Bellwin Scheme	1983
Independent flood risk governance	NA

To ensure comparability across partner countries, each case study predominantly represents an urban area that is vulnerable to flooding (fluvial and pluvial flooding). Case studies were selected to i) triangulate the research findings obtained from national level analysis and ii) examine the extent to which the national FRGA enables or constrains flood risk governance at the local scale. To optimise the value of this approach, each case study was selected for a range of different reasons to examine different facets of flood risk governance through which Flood Risk Management (FRM) is delivered (as summarised in table 1.2). Consequently, the type and number of research questions vary between each case study. Although it is not possible to infer national generalisations from these case studies and research findings must be interpreted and understood within these local contexts; case study research provided valuable insights into the interaction between the national and local scale (e.g. the implementation of national policy in practice). The location of these case studies is illustrated in figure 1.3.

Table 1.2: Key characteristics of selected case studies and research motivation

	Case study 1: Kingston-upon-Hull	Case study 2: The River Thames Scheme (Lower Thames)	Case study 3: The City of Leeds
Region and county	Yorkshire, North East England	Greater London, South East England	Yorkshire, North East England
City population	243,600	Ca. 800,000 in area of study	750,000 (3 rd largest city in UK)
River basin	River Hull, approx. 980km ² Confluence with the Humber estuary	River Thames approx. 12,935 km ²	River Aire, approx. 1,100 km ² .
Types of flooding	Fluvial, tidal and surface water	Fluvial, surface water and groundwater	Fluvial, surface water and groundwater
Research motivation	Several Flood Alleviation Schemes are at various stages of design, consultation and construction; the most of advanced of which is the Willerby and Derringham	The River Thames Scheme (RTS) is an example where a range of FRM measures are being considered at different spatial scales, including alleviation channels, dredging,	The Leeds city centre River Aire Flood Alleviation Scheme (RAFAS) represents an innovative project and will be the first time moveable weirs will have been installed in England to reduce flood risk.

	Case study 1: Kingston-upon-Hull	Case study 2: The River Thames Scheme (Lower Thames)	Case study 3: The City of Leeds
	Flood Alleviation Scheme (WADFAS). This study provides insights into mitigation measures are being incorporated within a traditionally defence-reliant regime.	increased flow capacity via weir amendments and property-level measures. This research examined the development of the RTS and impact of rule changes with the introduction of <i>Partnership Funding</i> in 2012.	The scheme has also received funding from atypical sources. In addition, we examined spatial planning, which was highlighted by national-level interviewees as an example of best practice.

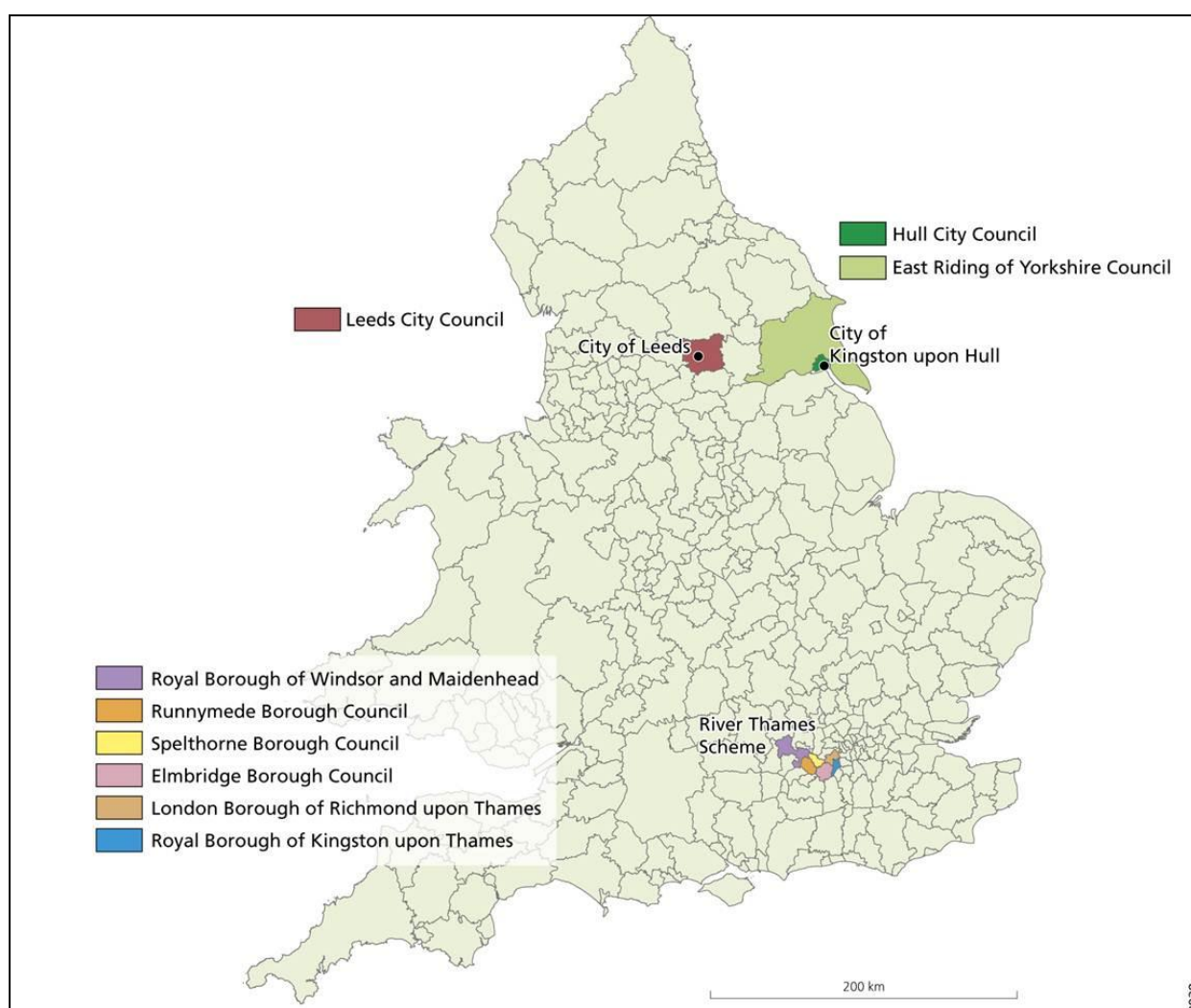


Figure 1.3: Selected case studies in England

1.4 Outline of the report

This report provides a comprehensive analysis of the national Flood Risk Governance Arrangement (FRGA). After describing the relevant contextual background, a review is provided of the current

FRGA and the extent to which FRM Strategies (FRMSs) are embedded in this arrangement. To understand how and why governance has formed in this way, Section 2.4 outlines the main explanatory factors accounting for stability and change in flood risk governance, considering both endogenous and exogenous drivers. Next, Section 2.5 highlights the key findings from evaluating flood risk governance in terms of its impact on *societal resilience*, its *efficiency* and *legitimacy*. This chapter raises interesting questions which are examined at the case study scale in Chapters 3 to 5 in the context of Hull, the Lower Thames and Leeds, respectively. Drawing these insights together, Chapter 6 summarises the key trends in flood risk governance, whilst Chapter 7 identifies the strengths and weaknesses of the current approach. From this, Chapter 8 provides a number of key recommendations for strengthening flood risk governance.

This report presents the key findings, only. Further depth is offered in a number of accompanying research reports²:

- I. *A multi-level analysis and evaluation of flood risk governance in England – opportunities and barriers in the pursuit of societal resilience* (Priest et al., 2015)
- II. *Exploring efforts to integrate surface water mitigation within a defence-reliant regime – A case study of flood risk governance in the Hull and Haltemprice catchment* (Alexander et al., 2015a)
- III. *Exploring the implementation of a multi-scale flood risk management scheme within the context of Partnership Funding – A case study into flood risk governance in the Lower Thames and the River Thames Scheme* (Micou et al., 2015a)
- IV. *Balancing flood risk with economic development through localised cooperation and innovative measures – A case study into flood risk governance in the city of Leeds* (Alexander and Priest, 2015)

² These reports will be made publically available in due course

2 Analysis of national flood risk governance

2.1 Introduction

This chapter presents the outcomes of policy and legal analysis of the national Flood Risk Governance Arrangement (FRGA). Relevant contextual background is provided in Section 2. Next, Section 3 summarises the main features of flood risk governance, and adopts a holistic perspective to examine the interactions across sub-arrangements. To understand how and why the FRGA has formed in this way, Section 4 looks to the past to assess the dynamics of the national arrangement, considering the explanatory factors accounting for periods of stability and change. This is followed by insights from evaluation, according to the desired outcomes of *resilience*, *efficiency* and *legitimacy*.

2.2 Contextual background

2.2.1 Exposure to flooding

England is susceptible to flooding from a number of different sources. It is estimated that one in six residential and commercial properties are at risk from fluvial, coastal or surface water flooding (EA, 2009a; Defra/EA, 2011a). These risks are exacerbated by a number of factors. For instance, exposure to coastal flooding is heightened by sea level rise, subsidence and isostatic rebound in certain areas, as well as coastal erosion (AMEC, 2014). Correspondingly, national flood policy is framed under the banner of “Flood and Coastal Erosion Risk Management” (FCERM). Surface water flooding is also recognised as an increasing problem in England, resulting from land use change, increased urbanisation and aging drainage infrastructure (Defra/EA, 2011a). In particular, the Summer Floods in 2007 and subsequent independent review by Sir Michael Pitt drew attention to the need to establish better arrangements for surface water FRM (Pitt, 2008). This led to significant changes in surface water flood risk governance (as documented in later sections of this report). The reported number of properties at flood risk are summarised in table 2.1. Whilst these figures guide national policy, Penning-Rowsell (2015) highlights the shortcomings of the Nation Flood Risk Assessment (NAFRA) and argues that this has led to over-inflated estimates of risk and flood damages. Nonetheless, this approach has become embedded and continues to inform flood risk reporting.

Table 2.1: The number of properties estimated to be at risk of flooding in England (Source: Ramsbottom *et al.*, 2012)

Type of flooding	Estimated number of properties
Fluvial or coastal flooding	3 million (1 million are also exposed to surface water)
Surface water flooding (including some properties also at risk of fluvial or coastal flooding)	4 million
TOTAL	6 million

2.2.2 Future risk

The *Foresight Future Flooding* project suggests that the risk of flooding in the UK will increase under scenarios for climate change, with sea level rise and increased precipitation heightening the likelihood of coastal, fluvial and surface water flooding (Evans *et al.*, 2004; 2008). According to the worst case projections, the number of those at risk of flooding could more than double by 2080.

Within the National Adaptation Programme³ (HM Government, 2013a) and Climate Change Risk Assessment⁴ (HM Government, 2012a), flooding is identified as a significant risk for the future. Some of these future projections are outlined in table 2.2. This underscores the importance for governance that supports adaptation and enhances societal resilience to flooding.

Table 2.2: Projections of flood risk in the UK based on projections for future population growth⁵
(performed as part of the UK Climate Change Risk Assessment and reported in Ramsbottom *et al.*, 2012)

Variable	By 2050s	By 2080s
People exposed to significant likelihood of flooding (current figure: 900,000 people)	1.3 and 3.6 million	1.7 and 5 million
Vulnerable people exposed to significant likelihood of flooding (based on the number of properties within the highest 20% of deprived areas at risk of flooding) (current figure: 70,000)	120,000 and 400,000	170,000 and 560,000
Number of properties exposed to significant likelihood of flooding (current figure: 560,000)	800,000 and 2.1 million	1m and 2.9 million
Expected Annual Damage to properties due to flooding (current figure: £1.2 billion)	£1.8 billion and £6.8 billion	£2.1 billion and £12 billion
Average annual insurance claims for flood-related damage (current figure: Between £200 million and £300 million)	-	£0.5 billion and £1 billion

(NB: Risk of flooding is based on an annual probability of 1.3% / 1 in 75 year flood event or greater)

2.2.3 Risk-enhancing factors

In addition to the effects of climate change, population growth and development on floodplains are identified as risk-enhancing factors (ASC, 2014). England's current population is estimated to be 53 million⁶, with projections for 2035 suggesting a 17% increase (Office for National Statistics, 2011). Furthermore, the shortage of land and demand for housing has implications for development in flood risk areas. This has implications for flood risk governance in terms of balancing sometimes conflicting demands and aligning relevant policy domains (*i.e.* flood risk management, spatial planning, economic growth *etc.*).

Whilst these factors will increase exposure to flood hazards, other factors could heighten social vulnerability and the distribution of flood consequences, such as the impact of an aging population (Tapsell *et al.*, 2002). Differences are also observed in flood risk awareness. UK research has shown that socio-economic class, flood experience and length of residency are the most powerful predictors of levels of understanding of one's property being at risk of flooding (Burningham *et al.*, 2008). This has a knock-on effect for preparedness behaviour and recovery from flooding.

³ The National Adaptation Programme is informed by the Climate Change Risk Assessment and is a requirement of the Climate Change Act 2008. This considers the cost-effectiveness of different adaptation options and outlines national priorities and policies to address these identified risks.

⁴ The Climate Change Act 2008 requests that a Climate Change Risk Assessment (CCRA) is conducted every 5 years to assess and compare the potential risks posed by climate change. This is completed by the Adaptation sub-committee, an independent expert body within the national Committee on Climate Change.

⁵ Risks are assessed for three time periods (2020s, 2050s and 2080s) and three different emission scenarios (high, medium and low), based on the UK Climate Projections report published in 2009. For climate-related risks (such as flooding), projected population growth is also considered; however, responses to climate risk (*e.g.* policy change) are not accounted for. In the context of flooding it is assumed that that Government will retain the existing line of flood defences.

⁶ Population estimate obtained for mid-2012, released by the Office for National Statistics in 2013

2.2.4 Legal and administrative landscape for flood risk governance

The legal landscape related to flooding in England is diverse and complex, reflecting the piecemeal nature of how it has developed (Section 2.4). In England, responsibilities for FRM are outlined in primary legislation⁷ (*i.e.* Acts of Parliament) and secondary legislation (*i.e.* Regulations). Further Guidance, Circulars and Codes of Practice may also be issued by Departments of State or empowered organisations (*e.g.* the Environment Agency) to enhance understanding and support the implementation of the law, as well as regulating official discretion.

The national FRGA and sub-FRGAs are shaped by multiple ‘rules’, including policy, legislation and informal rule systems. The Flood and Water Management Act 2010⁸ (FWMA) is the primary legislation in England relating to FRM, alongside the Flood Risk Regulations 2009⁹ (FRR). The FRR 2009 transposes the EU Floods Directive into domestic law¹⁰, with the Environment Agency and Lead Local Flood Authorities (LLFAs) identified as competent authorities. Amongst others, these actors constitute Risk Management Authorities (RMAs), as identified under the FWMA 2010 (see box 2.1). Although various statutory duties are placed on RMAs, it should be stressed that there is no statutory right to levels of flood protection and therefore no legislated Standards of Protection (SOP), as witnessed in the Netherlands for instance; thus RMAs exercise *permissive powers*, only.

Responsibilities for FRM have also been established through common law, as is characteristic of the English legal system. Riparian owners have the right to protect their property from flooding and erosion, but also have a legal duty to use their property or land in a way that does not increase the risk of flooding to a neighbouring property at the risk of a civil action (Environment Agency, 2013a).

Box 2.1: English Risk Management Authorities (RMAs) identified in the Flood and Water Management Act 2010

Environment Agency (EA)
Lead Local Flood Authority (LLFA) (*Unitary Authorities or County Councils*)
Internal Drainage Boards (IDBs) (where in existence)
District Councils
Highways Agency
Water Companies

Flood risk governance involves multiple actors, operating at national, sub-national and local scales. The overarching administrative structure for FRM is summarised in figure 2.1. Different responsibilities in FRM are assigned to these different types of actors, which make the actor arrangement in England one of the most complex in comparison to other STAR-FLOOD countries. It

⁷ Primary legislation is created following procedures in the House of Commons and House of Lords. Statutes are firstly introduced to the House of Commons in the form of a Bill and follow a series of readings, a committee stage and reporting stage, before following the same procedures in the House of Lords. Upon approval by Parliament the Bill must satisfy the formality of obtaining the Royal Assent.

⁸ HM Government (2010) Flood and Water Management Act 2010. Chapter 29. London: HMSO

⁹ HM Government (2009) Flood Risk Regulations 2009. No.3042. London: HMSO

¹⁰ English law must comply with EU law, as authorised by the European Communities Act 1972 (as amended). This Act also allows for the introduction of EU regulations and Directives, although these are mostly transposed into domestic law either by a new Act or Parliament or secondary legislation.

should be borne in mind that since 1998, certain aspects of central government have been devolved to democratically accountable Governments in Scotland, Wales and Northern Ireland. However this report is focused on governance arrangements in England only.

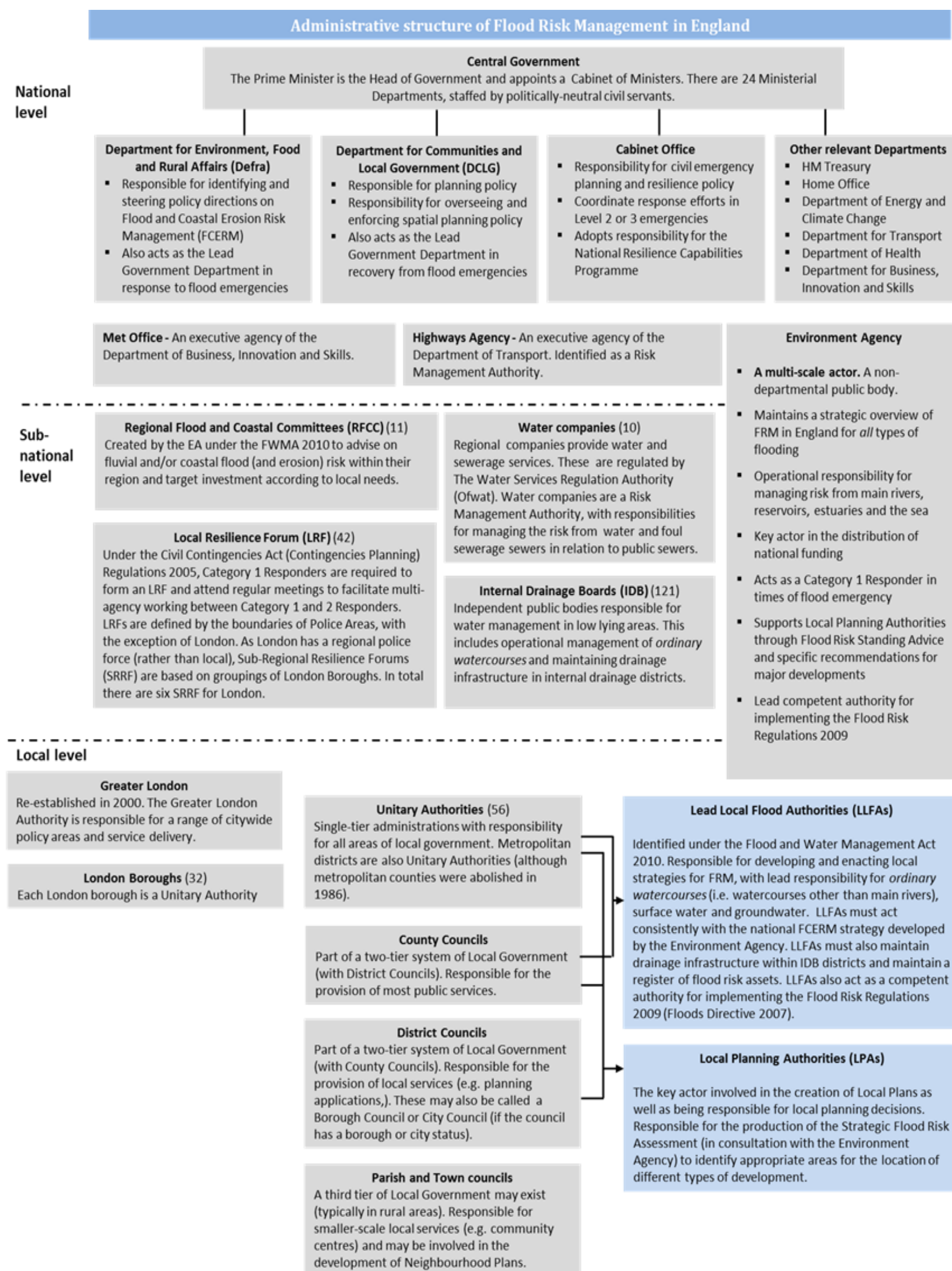


Figure 2.1: Administrative structure of Flood Risk Management in England

2.2.5 Interaction across policy domains

It is important to emphasise that FRM activities and governance structures are influenced by and/or enacted within, or in combination, with other legal and policy domains (as illustrated in figure 2.2). Therefore, although the FRM policy domain sits at the heart of the national Flood Risk Governance Arrangement (FRGA), this cannot be studied in isolation of other relevant policy domains (e.g. civil contingencies, spatial planning etc.).

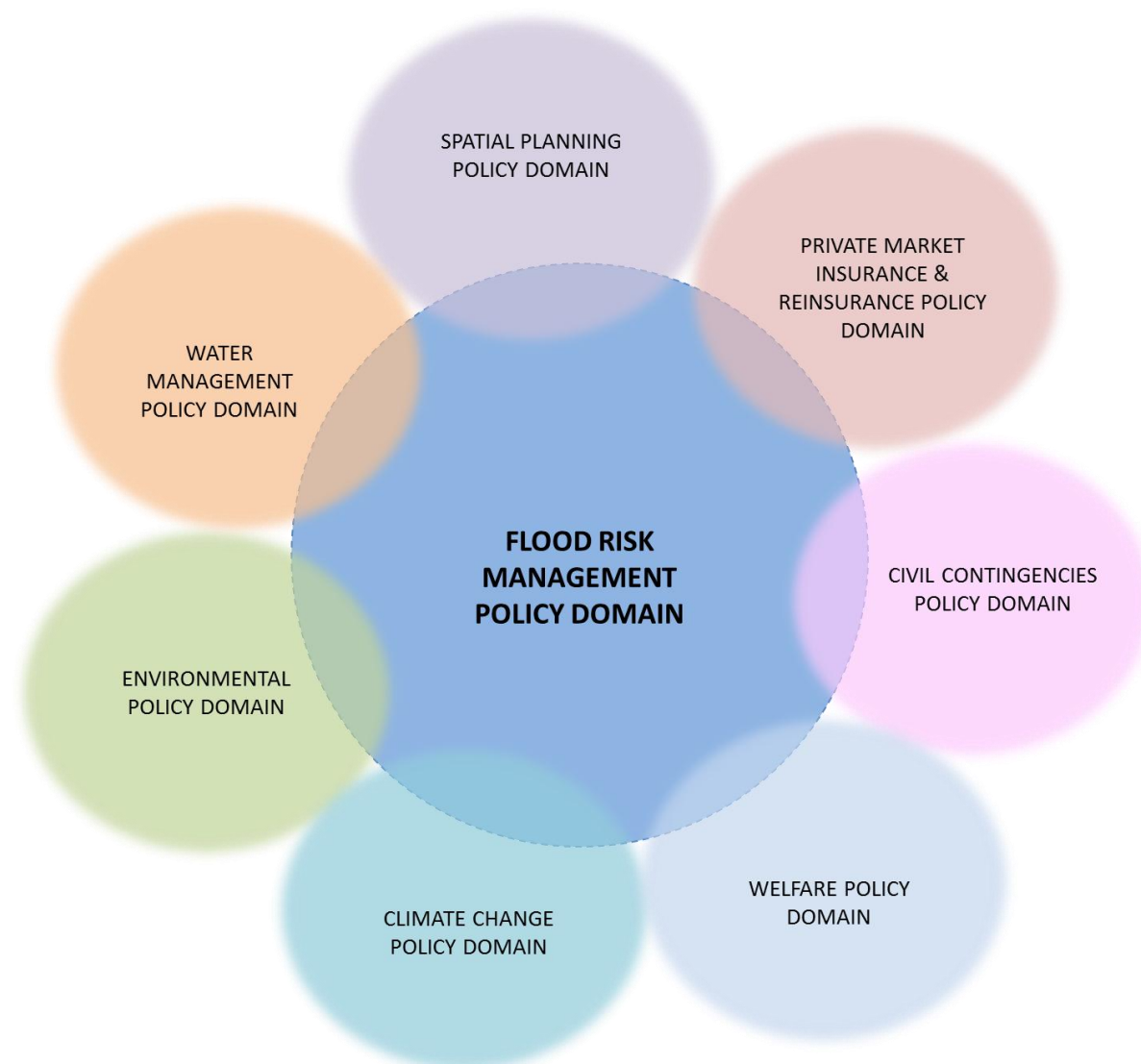


Figure 2.2: The intersection between the flood policy domain and other relevant policy domains
{Note: Although there are interactions between other policy domains, this diagram illustrates where other policy domains overlap with flood policy only. The importance of each policy domain on the FRM policy domain, and flood risk governance more broadly, is varied}.

2.2.6 Approach to Flood Risk Management

It is widely recognised that flood prevention through defence networks is not feasible for every at-risk location; rather sustainable Flood Risk Management (FRM) requires a portfolio of structural and non-structural measures to minimise the adverse, tangible and intangible consequences of flooding (Defra, 2005a; Defra/EA, 2011a). The sustainability of FRM is emphasised in national policy and refers to the importance of delivering socially, environmentally and economically viable approaches to FRM, which meet the needs of the present without compromising the needs of future generations

(Defra/EA, 2011a). In contrast to other STAR-FLOOD countries, each of the five STAR-FLOOD FRM strategies (FRMSs) have been embedded within the national FRGA (and relevant sub-arrangements) for c.65 years (Section 2.4). A range of FRM measures (FRMMs) have been consistently applied, but have arguably diversified within certain strategies in recent years, such as encouraging the uptake of property-level measures and community flood action plans to enhance strategies of *mitigation* and *preparation and response* (Defra/EA, 2011b; table 2.3).

Table 2.3: Some of the current measures employed in FRM, England

Flood Risk Management Strategies (FRMSs)	Flood Risk Management Measures (FRMMs)
Prevention This strategy aims to minimise people's <i>exposure</i> to flooding, this is achieved via measures that keep people and property away from water.	<ul style="list-style-type: none"> ▪ Spatial planning to influence location and layout of future development. The <i>sequential test</i> is a mechanism to reduce development on the floodplain. ▪ Multi-functional land use i.e. space is designated for several purposes (e.g. a park may also function as a flood storage area and is expected to flood during heavy rainfall)
Defence This strategy aims to minimise the <i>likelihood and/or magnitude</i> of flooding, via measures that keep water away from people i.e. measures that act to <i>resist</i> water.	<ul style="list-style-type: none"> ▪ Tidal surge Barriers and sluices ▪ Embankments ▪ Flood walls ▪ Conveyance engineering (e.g. dredging) ▪ Demountable defences
Mitigation This strategy aims to minimise the <i>likelihood and/or magnitude of flooding</i> , via measures that <i>accommodate</i> water.	<ul style="list-style-type: none"> ▪ Flood storage areas / retention basins ▪ Natural flood management measures e.g. peatland restoration, wetland creation, tree planting and restoration of riverside corridors ▪ Managed realignment ▪ Property <i>resistance</i> and <i>resilience</i> measures ▪ Green roofs ▪ Living walls ▪ Permeable pavements ▪ Designated floor heights above flood level
Preparation & Response This strategy aims to minimise the <i>consequences</i> of flooding via measures that strengthen societal capacity to prepare and respond to a flood event.	<ul style="list-style-type: none"> ▪ Flood forecasting ▪ Range of communication methods for disseminating flood warnings (e.g. Floodline warnings Direct service; local flood wardens) ▪ Targeted flood warning service for infrastructure ▪ Emergency management ▪ Promoting risk awareness amongst organisations and the public ▪ Community flood action plans ▪ Promoting activities at the household scale (e.g. property <i>resistance</i> and <i>resilience</i> measures)
Recovery This strategy aims to minimise the <i>consequences</i> of flooding via measures that seek to strengthen societal capacity to recover from a flood event.	<ul style="list-style-type: none"> ▪ Private market insurance ▪ Bellwin Scheme ▪ Local Authority to support community recovery post-flood ▪ Involvement of voluntary sector (e.g. National Flood Forum)

2.3 Overview of flood risk governance in England

The national FRGA is characterised by **eight distinct sub-arrangements**, as illustrated in figure 2.3. Within this conceptual diagram, the coloured circles encompassing each sub-FRGA illustrate where the STAR-FLOOD FRM strategies are embedded within flood risk governance. Each sub-FRGA is reviewed in turn in the following sections.

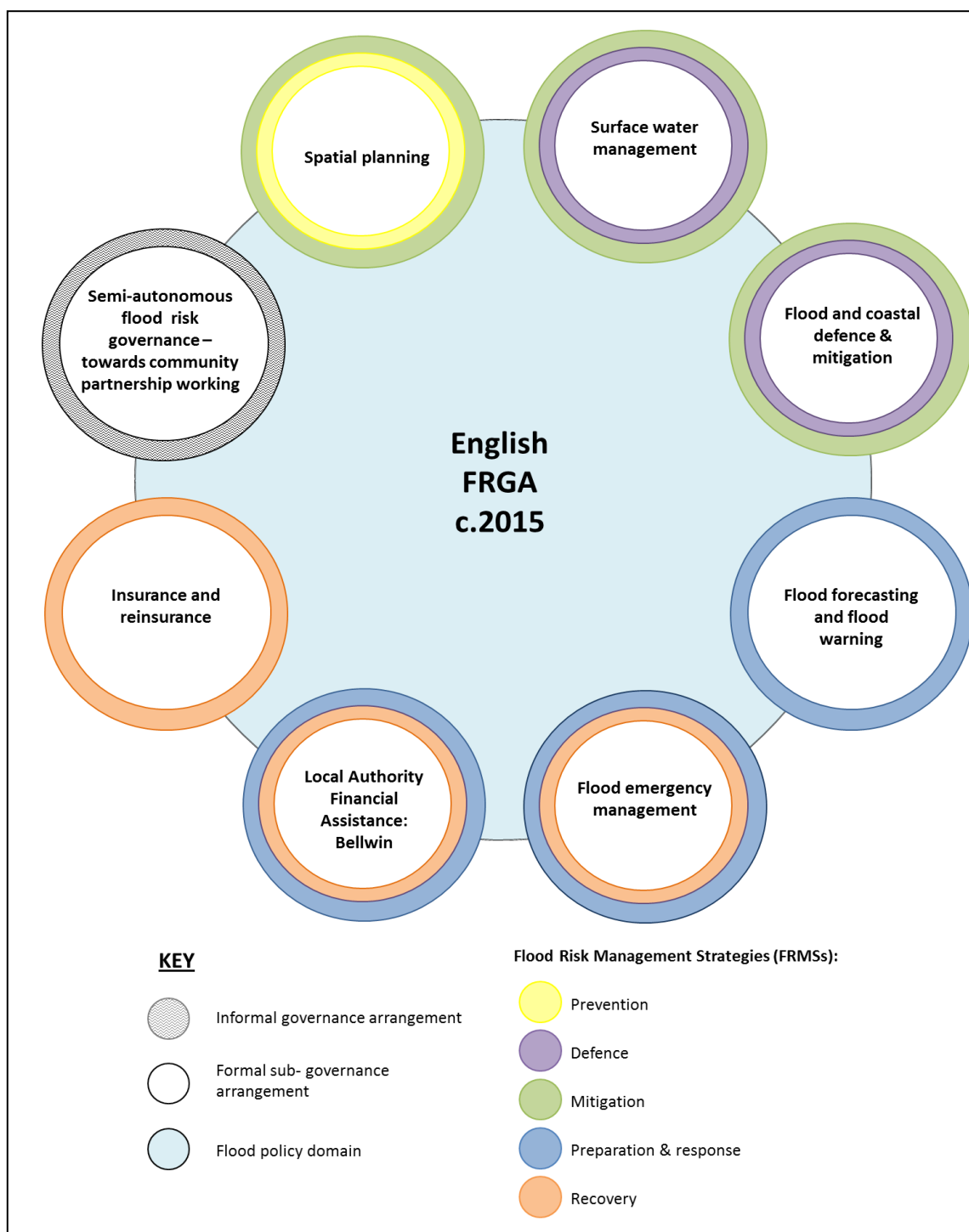


Figure 2.3: The national Flood Risk Governance Arrangement (FRGA) in England, 2015

{Note: Each sub-FRGA represents a distinct arrangement of actors, rules, resources and discourses related to key goals in FRM. These sub-arrangements are related to one or more FRM Strategies. Sub-FRGAs may also be related to one or more policy domains (as indicated in Figure 2.2)}.

2.3.1 Sub-FRGA for spatial planning

Spatial planning is the key strategy of *prevention* utilised in England. However certain conditions are often imposed on planning consents related to managing flood risk therefore there is also a cross-over with the strategies of defence or mitigation. Flood risk is one of a number of material considerations in spatial planning and in this regard the aim is to minimise the exposure of property (and people) by prohibiting or discouraging development in areas susceptible to flooding. In England, spatial planning is primarily embedded at local levels of government, although local institutions are required to be consistent with national planning policy; this comprises two key elements concerning i) strategic planning and ii) specific development applications. A summary of this sub-FRGA is provided in table 2.4.

Table 2.4: Summary of sub-FRGA for spatial planning according to the Policy Arrangement Approach

Key Actors	Key rules/legislation	Key Discourses	Resources
<ul style="list-style-type: none"> - Department for Communities and Local Government - Local Planning Authorities - Environment Agency - Planning Applicant or Developer - Lead Local Flood Authority 	<ul style="list-style-type: none"> - National Planning Policy Framework 2012 (DCLG, 2012) - Town and Country Planning Act 1990¹¹ - Localism Act 2011¹² - Sequential and exception tests - Policy Planning Guidance 25 (DTLR, 2001) 	<ul style="list-style-type: none"> - Sustainability - Participatory democracy - Localism and local decision-making - Efficiency - Economic growth 	<ul style="list-style-type: none"> - National Planning Portal - Indicative flood map for planning - Modelling and mapping for FRA - Professional planning staff

Figure 2.4 highlights the key actors involved in this sub-FRGA and how they inter-relate. Some actors will have roles in both strategic spatial planning (*i.e.* plan making; see top-half of figure) and spatial planning decision-making (bottom-half of figure). At the national level, the Department of Communities and Local Government (DCLG) are responsible for setting policy as well as having ultimate responsibility for policy enforcement. Preventing inappropriate development in areas at risk of flooding is the cornerstone of this sub-arrangement and from a rules perspective, the web-based guidance¹³ linked to the National Planning Policy Framework (NPPF) (DCLG, 2012), is one of the key policies which sets out a procedure by which this should be undertaken. Additionally, DCLG is required to work closely with the national actors overseeing flood risk, Defra and the Environment Agency, and ensure that planning policy is able to be implemented in line with flood risk policy. All planning documentation and decisions sit within the wider context of formal legislation surrounding (primarily) Town and Country Planning¹⁴; however this is a more general legal requirement rather than specifically governing any flood elements.

¹¹ Town and Country Planning Act 1990, c. 8

¹² Localism Act 2011, c. 20

¹³ For flooding this can be found at <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

¹⁴ Including Growth and Infrastructure Act 2013, c.27; Localism Act 2011, c. 20; Planning Act 2008, c.29; Planning and Compulsory Purchase Act 2004, c. 5; Town and Country Planning Act 1990, c. 8.

Many key actors involved in spatial planning are situated at the local level. Strategic local planning (through the preparation and adoption of Local Plans in accordance with the NFFP) is undertaken by Local Planning Authorities (commonly a borough or district council), who also have responsibility for assessing and approving individual planning applications and developments. With regard to flooding this means that LPAs are required to ensure that flooding is taken into account (through the preparation of a Strategic Flood Risk Assessment (SFRA)) (Defra/EA, 2014b), which directs the allocation of land for development as well as when planning applications are assessed. In the latter case, if a development is in an area of flood risk, or if it may negatively impact the flood risk to other properties, then a planning applicant (often a developer) is required to submit a Flood Risk Assessment (FRA) (Defra/EA, 2014b) to support their planning application and provide evidence for how they will meet the conditions of the Sequential test¹⁵ (e.g. including any remedial action they may take – see section A2.2.3). Most importantly, there is a statutory requirement¹⁶ for LPAs to consult the Environment Agency for proposed developments in areas at risk of flooding. LPAs must notify the EA of planning decisions that have gone against the EA's advice, or work with the EA to try to modify the application so that the EA withdraws their objection. Furthermore, in relation to understanding the flood risk, and when making decisions about permitting development in areas at flood risk, LPAs are required to work with other actors responsible for managing flooding such as Lead Local Flood Authorities and the Environment Agency.

Despite changes to the policy and documentation over the years, the discursive approach employed by spatial planning has remained consistent over a long period. Interviewees suggested that flood risk was always considered at the local level; however over recent years (since c. 2001) its consideration has been strengthened and made nationally-consistent through the introduction of specific flood related policies (e.g. Planning Policy Guidance 25 (DTLR, 2001), Planning Policy Statement 25 (DCLG, 2006) etc.) and instruments (e.g. SFRAs, FRAs etc.). Additionally, spatial planning processes have begun to more formally and consistently consider surface water flood risk through the consideration of SUDS.

¹⁵ The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a flooding of a lower probability.

¹⁶ Under the Town and Country Planning (Development Management Procedure) (England) Order 2010, Paragraph.

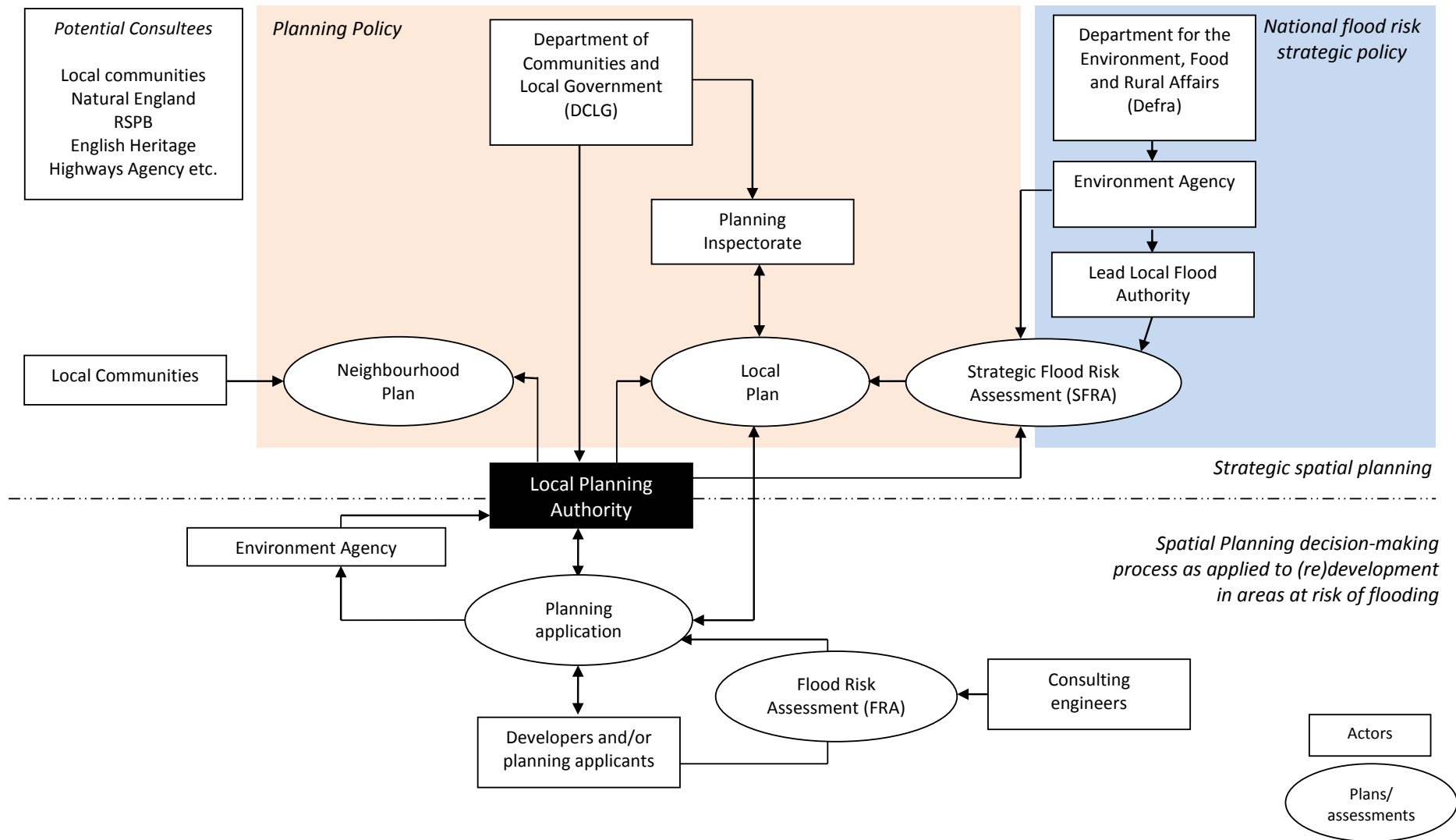


Figure 2.4: Linkages between actors, policies and instruments for spatial planning and flood risk

2.3.2 Sub-FRGA for fluvial and coastal flood defence and mitigation

This sub-arrangement involves aspects of defence and mitigation strategies. A baseline date for analysis of 1930 was selected as this marks the introduction of the Land Drainage Act 1930 and the first major reorganisation of flood management for over 500 years. A summary of this sub-FRGA is provided in table 2.5.

Table 2.5: Summary of sub-FRGA for fluvial and coastal flood defence and mitigation according to the Policy Arrangement Approach

Key Actors	Key rules/legislation	Key Discourses	Resources
<ul style="list-style-type: none"> - LLFA - EA - Defra - RFCC - Riparian owners - Highways Agency - Water companies (and regulator, OFWAT) - IDB - A range of other (private) actors may be contracted under new partnership agreements - Coastal groups - Natural England - Forestry Commission - RSPB 	<ul style="list-style-type: none"> - Flood and Water Management Act 2010 - Flood Risk Regulations 2009 - National Flood and Coastal Erosion Risk Management Strategy - FCERM Partnership funding 2012 - Long-term investment strategy (EA, 2014a) - Local Government finance settlements and local government income grants (e.g. LSSG, BRR, RSG) - Land Drainage Act 1991 - Water Resources Act 1991 - Environment Act 1995 - Environmental Assessment of Plans and Programmes Regulations 2004 - Coast Protection Act 1949 - FCERM appraisal guidance - HM treasury's Green Book - Funding rules within LAs, IDBs, RFCC and EA (e.g. levies and charges) - Environmental legislation (e.g. Water Framework Directive) 	<ul style="list-style-type: none"> - Risk - Sustainability - Adaptation - Structural and non-structural measures - Partnership - Resilience - Uncertainty - Participatory engagement - Localism - Urban FRM 	<ul style="list-style-type: none"> - FCERM Grant-in-Aid - Partnership funding - Modelling - National Assessment of Flood Risk (NaFRA) - GIS for mapping - Local knowledge - Multi-Coloured Manual for CBA (Penning-Rowse et al., 2013)

The Environment Agency (EA) is the dominant actor in this sub-FRGA and has operational responsibility for managing risk from main rivers, reservoirs¹⁷, estuaries and the sea. Overlapping this sub-FRGA and the sub-FRGA for surface water flooding, the EA also maintains a strategic overview of FRM in England for *all* types of flooding (established in the FWMA 2010) and plays a key role in the distribution of national funding for defence and mitigation works. Lead Local Flood Authorities (LLFAs) are responsible for developing and enacting local strategies for FRM, namely for *ordinary watercourses* (*i.e.* watercourses other than main rivers), surface water and groundwater; although it

¹⁷ The FWMA 2010 amends the Reservoir Act 1975 and introduces new arrangements for reservoir safety, based on risk rather than the size of the reservoir (this is positioned within the national governance arrangement for civil protection). Ultimately the Environment Agency has responsibility for the management of reservoir flood risk, however this remains outside the scope of STAR-FLOOD and is therefore not discussed further here.

should be noted that FRM plans must be consistent with the national strategy proposed by the EA. Both the EA and LLFAs are involved in activities to raise community awareness and encourage the uptake of property-level resistance and resilience measures; however, this is highly variable from place to place.

In areas where Internal Drainage Boards (IDBs) exist¹⁸, LLFAs must liaise with IDBs as they also have operational responsibilities for managing *ordinary watercourses* and maintaining drainage infrastructure within their internal drainage districts. Other actors with responsibilities at the operational level include the Highways Authority and water companies, who are also identified as Risk Management Authorities. At a policy level, the Department for Environment, Food and Rural Affairs (Defra) is the principal actor responsible for identifying and steering policy directions on flood and coastal erosion risk management. As a bridge to the local level, Regional Flood and Coastal Committees (created by the EA under the FWMA 2010) manage fluvial and/or coastal flood (and erosion) risk within their region by targeting investment according to local needs. Other important actors are riparian land or property owners who are required under common law to use their property or land in a way that does not increase the risk of flooding to a neighbouring property.

Flood management in England is characterised through three distinct paradigms over the past 80 years; shifting from land drainage (1930s – 1970s), to defence (1980s – 1990s), to FRM (2000 onwards) (Johnson *et al.*, 2005). In line with this, the *problematisation* of flooding has changed and corresponded with shifts in responsibilities and the distribution of power (Butler and Pidgeon, 2011). Penning-Rowsell and Johnson (2015) observe the scalar rearrangement of FRM from the local scale (ca. 1930s), through regionalisation and increasing centralisation (1940-1990s) to the emergence of a ‘new local’ today. Although the role of the Local Authorities (LAs) has broadened under the *localism* agenda in FRM, arguably power continues to be centralised. LAs may have more duties under the Flood and Water Management Act 2010 (FWMA), but remain dependent on Local Government Finance Arrangements and must adhere to national FRM policy and project appraisal (Penning-Rowsell and Johnson, 2015).

Important changes have occurred in relation to funding defence and mitigation projects. With the implementation of *Partnership Funding* in 2012, Grant-in-Aid (GiA) available through Defra is supported by funding sourced at the local level, via Local Authorities, the private sector or civil society (Defra, 2011b). Thus the costs for the project are distributed across funding partners according to risk sharing arrangements and defined in a legally-binding contract. This approach has the potential to change the make-up of the actor group with a financial stake in FRM and thereby the governance arrangements at the project-level.

2.3.3 Sub-FRGA for surface water management

In England, an estimated 4 million properties are at risk from surface water flooding (Ramsbottom *et al.*, 2012). For a long time surface water flood risk was neglected from formal arrangements of flood risk governance and a distinct sub-FRGA for surface water management did not emerge until 1989

¹⁸ Internal Drainage Boards are local public authorities established in areas of special drainage need in England, chiefly in low-lying areas primarily in East Anglia, Yorkshire, Somerset and Lincolnshire. Most IDBs today were established by the Government following the passing of the Land Drainage Act 1930. Today, there are 121 Internal Drainage Boards in Great Britain, 120 of which are in England.

following the privatisation of the water industry (Section 2.4). Following the Summer floods in 2007, this sub-FRGA has strengthened and a clear framework for responsibilities has emerged under the Flood and Water Management Act 2010. A summary of this sub-FRGA is provided in table 2.6.

Table 2.6: Summary of sub-FRGA for surface water flood management according to the Policy Arrangement Approach

Key Actors	Key rules/legislation	Key Discourses	Resources
<ul style="list-style-type: none"> - LLFA - Local Planning Authorities - EA - Defra - Highways Agency - Water companies (and regulator, OFWAT) - IDB - A range of other (private) actors may be contracted under new partnership agreements - Natural England - RSPB 	<ul style="list-style-type: none"> - Flood and Water Management Act 2010 - National Planning Policy Framework 2012 and Practice Guide - Flood Risk Regulations 2009 - National Flood and Coastal Erosion Risk Management Strategy - FCERM Partnership funding 2012 - Land Drainage Act 1991 - Water Industry Act 1991 - Water Resources Act 1991 - Environment Act 1995 - Highways Act 1980 - Environmental Assessment of Plans and Programmes Regulations 2004 - FCERM appraisal guidance - HM treasury's Green Book - Local Government finance settlements and local government income grants (e.g. LSSG, BRR, RSG) - Environmental legislation (e.g. Water Framework Directive) - Water Act 2014 - Future Water (Defra, 2008a) - Regulatory rules by OFWAT - Non-statutory technical standards for SUDS (Defra 2015a) 	<ul style="list-style-type: none"> - Risk - Sustainability - Adaptation - Partnership - Resilience - Uncertainty - Participatory engagement - Localism - Urban FRM 	<ul style="list-style-type: none"> - FCERM Grant-in-Aid - Partnership funding - Modelling - GIS for mapping - Online portal, Susdrain - Local knowledge

Overall responsibility for surface water FRM is assigned to Lead Local Flood Authorities (LLFAs). Under the FWMA 2010, LLFAs must develop, maintain, apply and monitor a local FRM strategy¹⁹; where local flood risk includes surface water, groundwater²⁰ and fluvial flood risk posed by ordinary watercourses. LLFAs are also responsible for maintaining a register of flood risk assets, structures and features which are likely to affect flood risk²¹. Under the Flood Risk Regulations (FRR) 2009, LLFAs have duties to identify flood risk areas, prepare hazard and risk maps and maintain a strategy for local FRM, consistent with the national strategy developed by the EA. Although duties for mapping this risk are conferred on LLFAs, in practice this continues to be carried out by the Environment Agency; however, LLFAs are required to supply relevant information and check the resulting maps against local knowledge.

¹⁹ Part 1, Section 9(1) in the Flood and Water Management Act 2010

²⁰ Note that responsibilities for groundwater flooding are beyond the scope of this research.

²¹ Section 21 of FWMA 2010

Under the FWMA 2010 it was proposed that unitary or county councils should establish a SUDS Approving Body (SAB) to ensure that development applications comply with national standards for Sustainable Drainage Systems (SUDS). Under this arrangement SABs would have adopted responsibility for long-term maintenance of SUDS. This approach was contested by developers who felt that this would have complicated the planning process. Furthermore, there was a concern that this would cause delays in development and conflict with the need for housing and economic recovery (House of Commons, 2015). A recent consultation on this matter between Defra and DCLG has resulted in the withdrawal of Schedule 3, the withdrawal of SUDS as a legal requirement and notion of SABs. Instead, SUDS will be treated as an additional planning consideration within the existing planning system (Defra/DCLG, 2014). Supporting developers and the review of planning applications, non-statutory technical standards have also been produced by Defra (2015a). Under this new arrangement, the developer is required to establish a maintenance regime that is best suited to the local flood risk, locality and type of development (Defra/DCLG, 2014). In theory, multiple arrangements could emerge whereby the developer, property owner, water company, Local Authority or outsourced service management company is assigned responsibility for maintaining SUDS. Following recent policy consultation, LLFAs will now act as statutory consultees to provide the necessary technical advice on major developments (DCLG, 2015), thus forging a closer attachment between the sub-FRGAs for spatial planning and surface water flood management.

Other relevant actors include Internal Drainage Boards (IDBs) (where in existence), district councils (where there is no unitary authority), the Highways Agency and water companies. Riparian owners are also responsible for keeping the drains clear in their properties and the ensuring that they do not drain water into their neighbour's property or foul drain (according to common law). As with the previous sub-FRGA, authorities may initiate programmes to encourage at-risk households to adopt property-level measures and act resist flooding at the property-scale.

2.3.4 Sub-FRGA for flood forecasting and warning

Following the devastation caused by the coastal floods in 1953, for the first time a national Storm Tide Forecasting Service (STFS) was established and operated by the Met Office. No formal arrangements existed for the dissemination of flood warnings at this time, but were enveloped within the broader activities performed by the Civil Defence Corps; a civilian voluntary organisation established in 1949 and disbanded in 1968. Following this, the police accepted responsibility in England for disseminating flood warnings under a voluntary agreement. To capture these shifts in governance dynamics, a baseline date of 1960 informed this research. This sub-FRGA is situated within the broader policy domain for civil contingencies (figure 2.2) and related to the STAR-FLOOD strategy for *preparation and response*. A summary of this sub-FRGA is provided in table 2.7.

Table 2.7: Summary of sub-FRGA for flood forecasting and warning according to the Policy Arrangement Approach

Key Actors	Key rules/legislation	Key Discourses	Resources
<ul style="list-style-type: none"> - Met Office - EA - Flood Forecasting Centre - LLFA - Other Category 1 Responders – including police, fire and rescue and LA may also be involved in communicating warnings - Public 	<ul style="list-style-type: none"> - Environment Act 1995 - Civil Contingencies Act 2004 - Civil Contingencies Act (Contingency Planning) Regulations 2005 - UK coastal monitoring and forecasting (UKCMF) service – strategy for 2009 to 2019 - Rules and targets related to the Trading Fund nature of the Met Office 	<ul style="list-style-type: none"> - Risk - Uncertainty - Stakeholder participations - Resilience - Non-structural measures for FRM - Vulnerability (linked to hard-to-reach groups) - Local knowledge 	<ul style="list-style-type: none"> - Scientific knowledge and input into technological advancement - Ensemble prediction systems - Levy charge on data underpinning weather and flood forecasts on user-organisations - Communication technology – including TV, radio, automatic voice messaging and social media - Financial resources provided by the EA - Mapping

The Met Office provides a Public Weather Service (PWS) for England, offering forecasts free-of-charge to the public. Also provided is a National Severe Weather Warning Service to give advance notice of weather with the potential to affect public safety (either because it may lead to flooding or some other risk). Although the Met Office provides a public service, it is also a ‘Trading Fund’ within the Department for Business Innovation and Skills and operates on a commercial basis under set targets. Combining forecast capabilities within the Met Office and the Environment Agency, the Flood Forecasting Centre (FCC) is a joint venture established in 2009 to provide forecasting for all types of flooding. Within this, is the UK Coastal Monitoring and Forecasting Service (UKCMF).

From forecasting, the Environment Agency (EA) is the lead actor responsible for the dissemination of flood warnings to the public and emergency responders. This is further facilitated by other Category 1 Responders (under the Civil Contingencies Act 2004) and the media, which have contractual agreements with the EA to relay flood warnings. An opt-out flood warning service is also established between the EA and telecommunication providers. At the local scale, members of the community may act as flood wardens (in agreement with the EA and community itself), providing a local source of flood information, ensuring warnings reach vulnerable groups and assisting in response efforts. Where established in the local community, Flood Action Groups (FAGs) may also operate in a similar capacity. Furthermore, informal networks amongst the public may also act as communicators of ‘unofficial flood warnings’ (Parker and Handmer, 1998).

2.3.5 Sub-FRGA for flood emergency management

Flood emergency management is related to the STAR-FLOOD strategy for preparation and response, and recovery. This involves all the activities related to the phases of emergency response and initial recovery in connection to a specific event, as well as longer-term preparation (pre-event) activities, which aim to enhance emergency management more generally. It should be emphasised that flooding is not isolated in civil protection legislation as a distinct problem, but rather enveloped within the broader concept of ‘emergency’ (as defined in the Civil Contingencies Act 2004). However

there exists a strategic policy framework called the National Flood Emergency Framework for England 2013 (NFEF), which is maintained by Defra. Stability within this governance arrangement was established for several decades, thus in order to capture the transition from civil defence to integrated emergency management, a baseline date of 1935 was identified (discussed further in Section 2.4). A summary of this sub-FRGA is provided in Table 2.8.

Table 2.8: Summary of sub-FRGA for flood emergency management according to the Policy Arrangement Approach

Key Actors	Key rules/legislation	Key Discourses	Resources
<ul style="list-style-type: none"> - LLFA - Police and transport police - Fire and Rescue Service - Ambulance service - Maritime and coastguard agency - Health authorities - Environment Agency - Utility companies - Telecommunications - Transport operators - Health and Safety Executive - NHS Trust Development Authority - Defra - DCLG – including Resilience and Emergency Division and Chief Fire and Rescue Advisor - Civil Contingencies Secretariat (CCS) - Cabinet Office Briefing Room (COBR) – including Prime Minister, Ministers and senior officials - Voluntary sector 	<ul style="list-style-type: none"> - Civil Contingencies Act 2004 - CCA (Contingency Planning Regulations) 2005 - Non-statutory guidance documents (e.g. HM Government, 2013b) - National Flood Emergency Framework for England 2013 - National Security Strategy - “Keeping the country running: Natural hazards and infrastructure” (Cabinet Office, 2011b) - Finance rules 	<ul style="list-style-type: none"> - Emergency - Integrated Emergency Management - Risk - Resilience - Vulnerability - Local knowledge 	<ul style="list-style-type: none"> - National Resilience Extranet; to be upgraded with ResilienceDirect Service - Hazard Manager - Flood Advisory Service - Web resources – including GOV.UK, local government association website - National Flood Emergency Framework 2013 - EA flood maps - ‘tough books’ - GIS for map production - Human resources – including voluntary sector and Mutual Aid Agreements - Funding via Local Services Support Grant - Funding available via the Bellwin Scheme for Local Authorities - National Asset Register of emergency resources

Emergency management in England is organised through a single statutory framework for local civil protection, called the *Civil Contingencies Act 2004*²² and the *Civil Contingencies Act (Contingency Planning) Regulations 2005*²³ (as amended) (hereforth referred to as the CCA and the CCA Regulations). Two core groups of actors are distinguished in the legislation; namely Category One and Two responders (as listed in table 2.9). Category One responders are central to ‘front line’ emergency response and are subject to the full set of civil protection duties to *assess, plan and advise* the public and other responders about potential and emerging risks. In addition, Category One responders have the duty to establish and maintain arrangements for sharing information, both with the public and other emergency responders. Also imposed on emergency responders is the duty to promote business continuity management and encourage businesses to develop recovery plans. Category Two

²² Civil Contingencies Act 2004. Chapter 36

²³ The Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005. Statutory Instruments. No. 2042

responders essentially function as ‘*cooperating bodies*’ to the Category One response and have a duty to cooperate and share information and advice with all necessary responders involved. Also obliged through the legislation is the need for responders to have due regard for the voluntary sector, although specific mechanisms for this are not outlined.

Table 2.9: Key actors in emergency management

Category one responders		Category two responders	
Local Authority	A county council, district council; including emergency management	Utilities	Electricity; Gas; Water and sewerage; Public communication providers
Emergency Services	A chief officer of Police; A chief constable of British Transport Police force; A Fire and Rescue authority; Maritime and Coastguard agency; Ambulance service	Transport Operators	Network Rail; Train operating companies; London underground and Transport for London; Airport operators; Harbour authorities; Highways Agency
Health authority	National Health Service Commissioning Board (NHSCB); Public Health England (PHE); Foundation trusts; Acute trusts	Health and Safety Executive NHS Clinical Commissioning Groups (CCGs)	
Environment Agency			

Overall, emergency management is guided by the principle of *subsidiarity*, which advocates the devolution of decision making to the lowest appropriate scale, with collaboration and coordination at the highest level necessary (Defra, 2013a). This means that in the context of Flood Incident Management (FIM) a range of different actors may become involved, depending on the scale of the flood event, as illustrated in figure 2.5. Ultimately, emergency management is under the authority of the Cabinet Office and the Civil Contingencies Secretariat.

Under the CCA Regulations 2005, Category 1 Responders are required to form Local Resilience Forums (LRF) and attend regular meetings to facilitate multi-agency, joined-up working, with the support of Category 2 Responders (Cabinet Office, 2011a). Facilitated through the LRF, is the development of multi-agency emergency plans and Community Risk Registers (CRR). At the community scale, certain RMAs such as the LA or EA may also steer the development of community flood action plans (Environment Agency, 2012a).

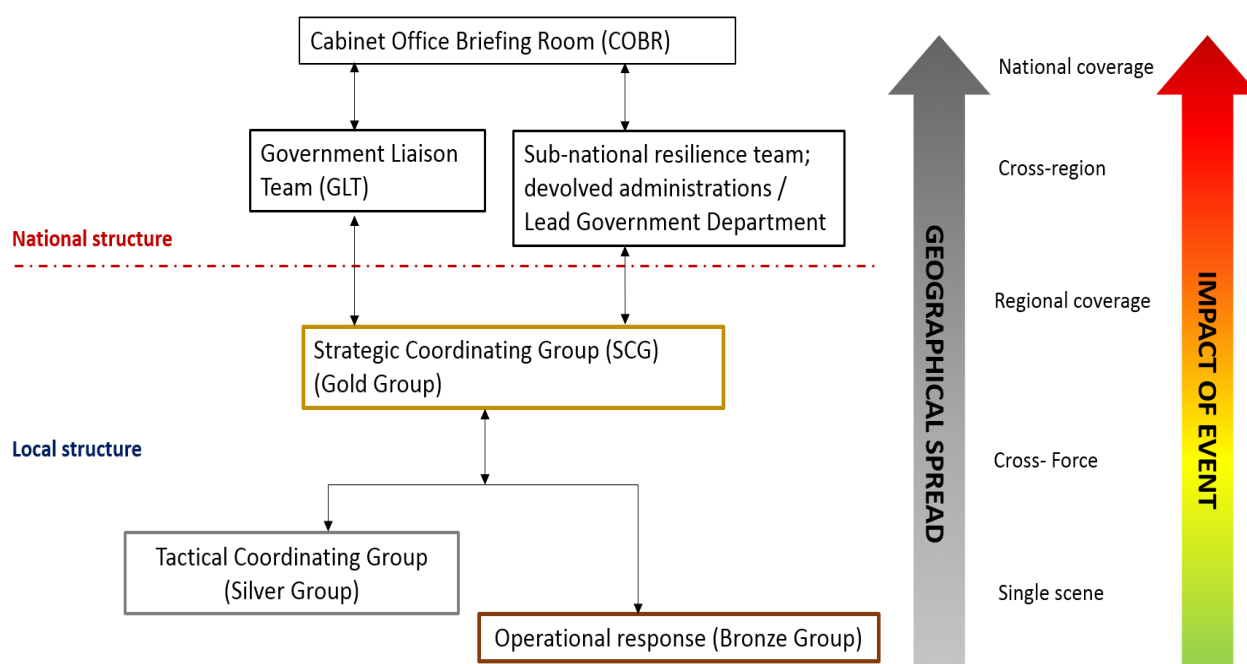


Figure 2.5: Command and control structure for emergency management in the UK (informed by HM Government, 2010; 2011)

As the “impact of event” increases (i.e. escalates in severity or geographical spread), higher tiers for command and control will be consulted (from Alexander, 2014).

2.3.6 Sub-FRGA for Local Authority response and recovery: The Bellwin Scheme

The Bellwin Scheme is a central government-funded and organised approach which provides funding for unexpected losses to local authority functions (DCLG, 2011a). The scheme is not only designed to provide financial assistance for losses caused by flooding but from a range of different types of incidents (e.g. extreme weather, major fire event etc.) which require emergency expenditure; thereby this sub-FRGA sits within the broader context of Local Authority recovery from losses. The baseline date for the arrangement within this research is 1983 as this was when the Bellwin Scheme was first initiated and the beginning of the formalisation and standardisation of the approach. However, the government did provide assistance to councils on a more *ad hoc* basis. The sub-FRGA is primarily part of the strategies of response and recovery although does link very loosely to other strategies as it aims to promote reduction of flood risk and/or better preparation from its impacts (see section A8). A summary of this sub-FRGA is provided in table 2.10.

Table 2.10: Summary of sub-FRGA for the Bellwin Scheme according to the Policy Arrangement Approach

Key Actors	Key rules/legislation	Key Discourses	Resources
<ul style="list-style-type: none"> - Department for Communities and Local Government - Local Authorities and other eligible organisations 	<ul style="list-style-type: none"> - Local Government and Housing Act 1989²⁴ - Eligibility requirements - Government guidance issued annually detailing specific organisational spending thresholds 	<ul style="list-style-type: none"> - Centralisation of funding - Moderated solidarity - Redistribution of losses - Financial and flood risk resilience planning 	<ul style="list-style-type: none"> - General taxpayer financed - EU solidarity fund

²⁴ Local Government Act 1989, S. 42

There are relatively few actors involved in this sub-FGRA. Firstly, at a central government level the scheme is administered by the ministerial Department for Communities and Local Government (in the past administered by this department's predecessors) and it is to DCLG that those seeking funds at the local level are required to submit an application detailing eligible expenditure. The Local Government and Housing Act 1989 is the principal legal instrument through which the Scheme is enacted although guidance notes are issued annually (e.g. DCLG, 2013a) to provide details to organisations wishing to gain funds and to set funding thresholds. A previous piece of legislation (Local Government Act 1972²⁵) had already imposed the responsibility on local authorities for dealing with emergencies. The 1989 Act provides the key principles of the Bellwin Scheme (including the qualifying incidents, thresholds and amounts recoverable) and this original legislation (as well as further amendments and other Acts²⁶) sets out those organisations eligible to apply for funding. These include local authorities, police and fire authorities and National Park Authorities. Significantly, the rules are also designed to provide a limit on reimbursement and encourage local authorities to act in a prudent manner and build in some degree of resilience and financial reserves for emergency expenditure (Penning-Rowsell and Wilson, 2006).

2.3.7 Sub-FRGA for insurance and reinsurance

Flood insurance in England is provided as part of general household insurance (buildings and contents) and therefore sits within a broader policy domain of household insurance and reinsurance provision. A summary of this sub-FRGA is provided in table 2.11. This sub-FRGA is firmly aligned with the strategy of recovery and is the primary mechanism by which individuals and businesses are able to ensure financial assistance following flooding. Although this sub-FRGA is principally dealing with recovery, it is important to note that the presence of a well-functioning insurance system, with high penetration underpins many of the other flood risk management systems. The specific details of this sub-arrangement have evolved in a very piecemeal way, however the fundamentals have remained unchanged since the 1920s and this therefore serves as the baseline date for the purposes of this research. Insurance has always been provided via the private insurance companies and for many years operated purely on a market basis: *i.e.* insurance companies were free to decide who to insure and at what premium cost. It is provided as a standard part of a composite policy and buildings insurance is compulsory for those with mortgages, creating a situation with high insurance penetration. From 2016 a not-for-profit reinsurance fund, Flood Re, will be introduced. Although the majority of households will not be affected, the new approach enables the formal cross-subsidisation of those properties at higher risk of flooding and the provision of a premium cap, thereby limiting the cost of insurance to those households.

²⁵ Local Government Act 1972, S. 138.

²⁶ *e.g.* Police Act 1996; The Greater London Authority Act 1999; Criminal Justice and Police Act 2001; Local Government Act 2003; Criminal Justice and Police Act 2001.

Table 2.11: Summary of sub-FRGA for flood insurance and reinsurance according to the Policy Arrangement Approach

Key Actors	Key rules/legislation	Key Discourses	Resources
<ul style="list-style-type: none"> - Private insurance companies - Global reinsurers - Association of British Insurers - Property and business owners 	<ul style="list-style-type: none"> - Informal Statement of Principles (ABI, 2002; 2005; 2008) - Solidarity II²⁷ 	<ul style="list-style-type: none"> - Individual responsibility for recovery - Financial resilience - Technocratic - Private market solutions 	<ul style="list-style-type: none"> - Funded via solidarity between policyholders (intra-company) - High risk properties ceded into Flood Re, risks are spread across all policyholders (inter-company) - Flood maps and modelling

Before the implementation of Flood Re, two key actors are involved in the direct provision of flood insurance: the insurer and the policyholder (whether that is a business or a property-owner) and in general the contract for insurance is directly between the insurer and the insured (although brokers may act as intermediaries). However, Flood Re will introduce additional complexity within the domestic market, with a company set up by the industry to manage the reinsurance fund and an increased regulatory role for government. Those companies providing flood insurance remain subject to the same general national²⁸ and EU²⁹ rules about financial service provision; however Flood Re has necessitated the introduction of additional legislation.^{30,31} Importantly, the adoption of this new approach aims to ensure the universality and affordability of insurance for the majority of domestic properties (there are some notable exceptions) and manage the transition in the long term towards risk-reflective pricing of flood insurance.

2.3.8 Semi-autonomous flood risk governance

A number of flood management actions are undertaken by both individuals and business owners which exist outside the more formal sub-arrangements. This includes ‘bottom-up’, community-led initiatives, as well as the actions undertaken by businesses and large corporations. In some cases, these activities may be self-starting (*i.e.* not initiated by RMAs), although the extent to which these can be described as fully independent from the national FRGA is debateable; thus we coin the term ‘semi-autonomous’ to capture this mode of self-governance.

At the individual, household and community scale, self-governance is observed in England in a number of forms. These include;

- **Installation of property-level resistance and resilience measures;**
- **Purchasing insurance products or opting to ‘self-insure’;**

²⁷ European Parliament and of the Council (2009) Directive 2009/138/EC

²⁸ *e.g.* Competition Act 1998, Chapter 41.

²⁹ *e.g.* Commission Regulation No 3932/92 on the application of Article 85 (3) of the Treaty to certain categories of agreements, decisions and concerted practices in the insurance sector, Official Journal of the European Communities, No L 398/7, 21 December 1992, Brussels; Directive 2009/138/EC on the taking-up and pursuit of the business of insurance and reinsurance (Solvency II), Official Journal of the European Union, L 335/1.

³⁰ Water Act 2014, Chapter 21, part 4.

³¹ The Flood Reinsurance (Scheme and Scheme Administrator designation) Regulations 2015 – *Draft Regulations laid before Parliament under section 84(6) of the Water Act 2014 in March 2015.*

- **Formation of local community groups;** these may be involved in campaigning and lobbying for structural defences or other flood management measures; whereas others are involved more actively in undertaking flood management. The National Flood Forum (NFF) is a registered national charity that provides a simple step-by-step guide about how to set up a flood action group³²; however group structure varies.
- **Community flood warning systems;** for example, McCarthy *et al.* (2006) describe a situation in Thames Ditton (an island community in the River Thames west of London) where dissatisfaction with the official flood warning system has led to the community developing their own. The community has developed its own processes of observing the river and a communication system which inputs the advice of trusted local lock-keepers; they then work together to decide upon and activate a collective community response (Parker *et al.*, 2009).

Although these activities can be self-governing, local communities often seek the advice and support of the Local Authority (LA) or Environment Agency (EA). In this sense, interactive modes of governance are often present (discussed further in Section 2.3.9). As outlined by Geaves and Penning-Rowsell (2015), flood action groups may form *contractual* or *cooperative* relationships with public actors and be driven by different motivations. Contractual arrangements appear to develop when there is a breach in a perceived contract, for example flood defence is expected in exchange for taxes; therefore, such groups tend to focus on the implementation or strengthening of new defences. In contrast, cooperative arrangements are evident where communities have embraced Partnership Funding are working to enhance their flood preparedness (*e.g.* warden schemes and flood action plans).

Efforts to enhance community engagement in FRM have noticeably increased. For instance, in 2012 the Department for the Environment, Food and Rural Affairs (Defra) launched the *Flood Resilience Community Pathfinder scheme* through which £5m was made available to 13 selected for the purpose of enhancing local responses to flood risk. This included a range of different methods, at different spatial scales, from river monitoring, interactive flood ‘toolkit’ websites (see Northamptonshire County Council, <http://www.floodtoolkit.com/>), to the development of community Flood Action Plans to support emergency response and enlisting voluntary flood wardens to disseminate official flood warnings. A property-level protection grant scheme was also trialled between 2009-2011 to alleviate risk in selected communities, increase awareness of such measures and demonstrate their cost-effectiveness (JBA, 2012). Such initiatives are encouraged through the *Strategic National Framework on Community Resilience* (Cabinet Office, 2011c). This is part of a broader effort to enhance self-reliance and empower local communities (Nye *et al.*, 2011).

Flooding is often considered and embedded within the corporate governance activities of private companies. When risks are very high companies may consider purchasing (off the shelf or bespoke) flood resistance measures to protect their properties and others may have emergency plans in place to move stock and/or equipment away from the flood waters. In recovery terms, some businesses may choose to purchase a number of private insurance projects (including structural, stock and contents, and business disruption cover) and these are often priced on a case-by-case basis. However, other companies and particularly large corporate chains tend to self-insure their risks.

³² www.nationalfloodforum.org.uk/flood-risk-community-groups/how-to-form-a-flood-action-group/

A slightly different form of self-governance is evident in private sector utility companies, which were privatised in England in the 1980s, but remain highly regulated. Utility companies are licensed and as such have to meet certain government-legislated criteria related to maintaining a service and a continuous supply. Regulation organisations (e.g. Ofgem³³, Ofwat³⁴ and Ofcom³⁵) also enforce restrictions about the pricing of utilities and oversee spending and investment in infrastructure. This role has become even more important following the 2007 floods which had an unprecedented impact on critical infrastructure (in particular on water and electricity supplies) and the subsequent recommendations in the Pitt Review. These recognised the importance of improving the resilience and resistance of infrastructure to flooding in the future. The regulators have the power to specify investment on resilience as part of their periodic Price Control Review responsibilities. This means that the regulators are able to impose how resources gathered through price increases are spent and part of this has involved increasing the resilience of critical infrastructure to flooding. For example, this has included for electricity companies the requirement to improve the resilience of substations over the next 10 years and the ring-fencing of approximately £110 million for these activities (Ofgem, 2009). Ofwat have also proposed to increase the resilience of water infrastructure through the price review mechanism. Despite some opposition from water companies, their final determination has allocated £414 million to increase resilience to natural hazards by 2016.

The call for improvements to the resilience of these types of assets (as well as others) has been reinforced by new reporting requirements on adaptation imparted as part of the Climate Change Act 2008. The Act provides the Secretary of State with the powers to require authorities (including utility companies) to report on their risks related to climate change and the actions they are taking to adapt to these risks, including flooding.

2.3.9 Modes of governance

In conceptual framework proposed by Driessen *et al.* (2012), five typical modes of governance are distinguished: including centralised, decentralised, public-private, interactive and self-governance. Based on this framework, this analysis highlights important differences in the *modes of governance* adopted within each sub-FRGA. These differences are reflected in different arrangements of actors, institutional structures and content, and are summarised in table 2.12.

Characteristics of *centralised governance* are dominant in the sub-FRGAs relating to fluvial and coastal defence and mitigation; flood warning and forecasting, flood emergency management; and Local Authority recovery via the Bellwin Scheme. The Environment Agency (EA) is an important actor in several of these. Firstly, the EA maintains a strategic overview of FRM in England for *all* types of flooding (under the Flood and Water Management Act 2010); as well as having operational responsibility for managing risk from main rivers, reservoirs, estuaries and the sea. The EA also plays a key role in the distribution of national funding for flood defence and mitigation works. Power is also exercised over civil society actors. Indeed, although riparian land and property owners have a

³³ Office of Gas and Electricity Markets <https://www.ofgem.gov.uk/>

³⁴ Water Services Regulation Authority <http://www.ofwat.gov.uk/>

³⁵ Independent regulator and competition authority for the UK communications industries (see <http://www.ofcom.org.uk/>)

number of responsibilities, these are often poorly understood (especially in urban areas); thus the State often intervenes.

However, interesting shifts appear to be occurring recently with the introduction of the new *Partnership Funding* scheme to finance defence and mitigation works (Environment Agency, 2012b). Under this new approach risk-responsibilities may be shared across State, market and civil society actors at the scale of individual projects or flood risk measures. In this context, sub-FRGAs for fluvial and coastal defence and mitigation, as well as surface water flood management, display some traits of *interactive governance*; although the degree of equality between actors is likely to vary depending on risk-sharing agreements.

Table 2.12 Modes of governance adopted by sub-FRGAs in England

Sub-FRGA	Mode of governance
Spatial planning	Decentralised, with aspects of centralised governance
Fluvial and coastal defence and mitigation	Centralised, with aspects of decentralised and interactive governance
Surface water flood management	Decentralised, with aspects of centralised and interactive governance
Forecasting and flood warning	Centralised, with aspects of public-private governance
Flood emergency management	Centralised, with devolved responsibilities based on principle of subsidiarity
Insurance and reinsurance	Public-private governance
Local Authority recovery: Bellwin Scheme	Centralised
Semi-autonomous flood risk governance	Self-governance, with aspects of interactive governance

Flood emergency management is somewhat more complicated to unpick. The principle of subsidiarity advocates the devolution of decision making to the lowest appropriate scale, with collaboration and coordination at the highest level necessary (Defra, 2013a). Mechanisms for up-and-down-scaling emergencies (figure 2.5) result in shifting modes of governance. This approach acknowledges the importance of local-scale decision making, whilst recognising the need for mechanisms to coordinate emergency response and recovery activities for significant incidents. The mechanisms that are in place to facilitate this (*e.g.* Local Resilience Fora, DCLG-RED resilience advisors, emergency level triggers *etc.*) are established through primary and secondary legislation, as well as non-statutory guidance documents. Ultimately, flood emergency management operates under the authority of the Cabinet Office and involves a range of public actors and Government Departments; whilst the involvement of civil society actors (including the voluntary sector) is somewhat variable from place to place.

Although centralisation is a recurring theme, there are also examples of *decentralised* governance, evident in the sub-FRGAs for surface water flood management and spatial planning. Lead Local Flood Authorities (LLFAs) are the dominant actors involved in surface water flood management; although local FRM plans must be consistent with the national strategy and policy proposed by the Environment Agency and Department for Environment, Food and Rural Affairs (Defra), respectively. Similarly, most planning activities and decisions are undertaken at the local level by Local Planning Authorities (LPAs), though planning decisions and local strategies must also be in line with national governmental policy. Although local Governments are not entirely autonomous in their decision-

making, these sub-arrangements display stronger synergies with decentralised governance according to the framework proposed by Driessen *et al.* (2012).

Flood insurance is the only sub-arrangement which wholly reflects *public-private governance*. This is a primary form of recovery and has always been provided via private insurance companies, operating purely on a market basis. However, the proposal for a new scheme, *Flood-Re*, suggests a higher degree of Government involvement and regulation, indicating a potential shift in the distribution of power between the State and the market (Defra, 2013b). Despite this, the sub-FRGA is still characteristic of public-private governance.

Aside from the formal sub-FRGAs, semi-autonomous flood risk governance also exists in England. This includes ‘bottom-up’, community-led initiatives, as well as the actions undertaken by businesses and large corporations (Section 2.3.8); thus a wide range of governance structures exist. The common threads connecting these are that they adopt modes of *self-governance*. However, in the context of community-level activities this is often accompanied with *interactive* forms of governance as local communities often seek the advice and support of the Local Authority (LA), the Environment Agency (EA) or National Flood Forum (NFF) (Geaves and Penning-Rowsell, 2015). This research considered where to locate community-level initiatives and determined that this conceptual boundary should be based on the degree of involvement of formal actors and ownership of responsibility. Therefore, when initiatives are strongly steered by formal actors these are situated within the relevant sub-FRGA (depending on the nature of the initiative). For instance, the development of community flood action plans is accommodated within the sub-FRGA for flood emergency management, whilst efforts to encourage the uptake of property-level measures is situated in the sub-FRGAs for fluvial/coastal and surface water management, unless these are otherwise self-governed at the community, household or individual scale. This boundary between the formal sub-FRGAs and the semi-autonomous sub-FRGA can be somewhat blurred. Indeed, some local communities may be empowered by activities initially started by formal actors and adopt ownership of these. Indeed there is clear evidence at the national scale of attempts to devolve some responsibility away from the State to the local level and encourage bottom-up activities to facilitate ownership of flood risk management amongst at-risk communities (*e.g.* Defra, 2012a). In this sense, self-governance and interactive governance appear to be increasingly seen as desirable and may increase in importance.

2.3.10 Bridging mechanisms

Although sub-FRGAs operate as distinct entities within the national governance arrangement there are a number of linkages between these. We adopt the term bridging mechanisms and processes to capture these connections. ***Bridging mechanisms*** can be defined as the instruments or ‘tools’ which facilitate integration between sub-FRGAs (*i.e.* connecting actors, tasks *etc.*), such as legal mechanisms (*e.g.* duties to cooperate) or technological mechanisms (*e.g.* outputs from flood modelling). ***Bridging processes*** define the interactive ways through which sub-FRGAs are coupled; for instance, whereas the statutory duty to form Local Resilience Fora (LRF) is a bridging *mechanism*, the interaction created through regular meetings convened through the LRF represent a *process* of bridging actors.

Despite the seeming fragmentation of having multiple sub-FRGAs within the national governance arrangement for FRM, a range of bridging mechanisms and processes exist to link these. Important 'bridges' have been created through **legislation**. Firstly, under the Floods and Water Management Act 2010 (FWMA, 2010) the Environment Agency has acquired the duty to maintain a strategic overview for *all* types of flooding. Other Risk Management Authorities (RMAs) must act consistently with the national strategies developed by the EA and seek permission for defence and mitigation works. Although the remit of the EA has grown since it was established in 1996, the passing of the FWMA 2010 has helped unify the sub-FRGAs for fluvial/coastal and surface water flood management in particular and ensure a greater degree of national consistency.

There are a number of aspects that have led to the greater consideration of flood risk within spatial planning, such as the introduction of the sequential and exception tests³⁶ in planning policy (DCLG, 2006; 2012) and the obligation to complete Strategic Flood Risk Assessments (SFRA; since DCLG, 2006). Local Planning Authorities (LPAs) are also required to seek the advice of the EA about flood risk before approving planning applications. Furthermore, the recent introduction of SUDS within the planning process will strengthen the link between FRM and spatial planning.

An important feature of recent legislation is the duty to cooperate and share information. The FWMA 2010 included a power³⁷ for LLFAs and the EA to request information from others in relation to their FCERM functions, as well as civil sanctions to impose this duty³⁸. This is somewhat more problematic in the context of companies (and in particular water companies to which this is likely to apply) as there are concerns about the disclosure of information and whether this is anti-competitive. These adjunct modes of corporate governance could prove problematic and a potential barrier to successful partnership working. This was highlighted for further study through case study research.

Cooperation and coordination is also required by the Civil Contingencies Act 2004 and the CCA Regulations 2005. Within this legislation, Category 1 and 2 Responders are required to participate in Local Resilience Fora (LRF) to collectively assess, plan and prepare for emergencies such as flooding (Cabinet Office, 2011). Supporting the roles of emergency professionals, various Mutual Aid Agreements (MAA) exist to support the sharing of human resources between Local Authorities (Cabinet Office, 2012a). Additional support can also be sourced via Military Aid to the Civil Authority (MACA) arrangements, though assistance is only available when resources allow. However, some interviewees remarked that this latter arrangement is somewhat redundant given the existing mechanisms in place and more of a feature of 'being seen to act' for political purposes (as was the case in the Winter floods 2013/14).

Technological bridging mechanisms are also important and were widely discussed during interviews with flood risk professionals. For example, the introduction of online portals for information sharing

³⁶ If it is not possible for development to be situated in an area with a low flood probability after following the sequential test, the exception test can be applied. This means that development can go ahead if it is demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk and that the development is safe for its lifetime and does not increase flood risk elsewhere.

³⁷ FWMA 2010, s.14

³⁸ Ibid, s. 15.

and networking within and between actor groups (*e.g.* Resilience Direct³⁹ and Hazard Manager⁴⁰), can better facilitate the diffusion of ideas and knowledge of best practice. Furthermore, the provision of flood maps from the EA to professional and public stakeholders supports a host of activities, such as spatial planning, emergency management and awareness-raising amongst at-risk communities. In this context, flood modelling and mapping can be thought of as an essential bridging mechanism.

Bridges to research should also not be underestimated. Defra and the EA jointly support a Research and Development (R&D) programme to ensure that FCERM measures are delivered in a technically and environmentally sound and cost-effective manner. Furthermore, this programme aims to bridge the gap between research and the development of operational systems. The EA is also actively involved in the Living With Environmental Change (LWEC) initiative, which constitutes a partnership between UK Governmental Departments and agencies, Local Government, research councils and universities. This not only contributes an important knowledge resource, but is also influential for practice and policy directions in FRM. Climate science research is also a dedicated task of the Hadley centre within the Met Office. In FRM, we have also seen the emergence of a ‘flood management community’ of policy-orientated applied researchers and private FRM consultants who also push the theoretical frontiers and redefine policy questions to inform better practical solutions (*e.g.* Flooding and Coastal Erosion Risk Management Network⁴¹). This is an expanding community, facilitated by such interdisciplinary bodies such as the Chartered Institution of Water and Environmental Management (CIWEM). In general, there has been a move amongst research funders towards supporting interdisciplinary research with clear tangible implications and applications for practice. This represents an effort to better bridge historically divided worlds of research and practice to facilitate the uptake of new knowledge and technologies.

2.4 Explanations for stability and change in Flood Risk Governance in England

Identifying and explaining change and stability in flood risk governance in England is complex. It is complicated by the observed diversity within the English national governance arrangement (figure 2.3), with not all sub-FRGAs changing (or remaining stable) concurrently. There are multiple scales of change and change/stability variables are acting at different levels in English flood risk governance (table 2.13). This section examines the changes to the national governance arrangement and its structure over the past 80 years. Building upon this, and evidence from case study research, Chapter 6 summarises the main trends in flood risk governance.

2.4.1 Identifying shifts in the national Flood Risk Governance arrangement

Smaller individual changes are important to consider as over time these different adjustments may combine and finally lead to, or themselves constitute, more significant changes in governance. Additionally, modifications will be made to activities which could impact both on the processes and outcomes of flood risk management. Looking ahead to designing or strengthening governance arrangements, it is important to consider what is able to be achieved without requiring significant governance interventions. However, this analysis will only consider these more minor changes where


³⁹ Information about ResilienceDirect is available from <https://www.gov.uk/resilient-communications>

⁴⁰ Information about Hazard Manager is available from <http://www.metoffice.gov.uk/publicsector/hazardmanager>

⁴¹ <http://www.fcerm.net/>

they have had a significant impact or are important to explaining more considerable change. This section focusses on analysing change and stability at broader levels *i.e.* focused on the composition and structure of the overall FRGA, as well as broader changes to the flood policy domain.

Table 2.13: Four key types of changes being examined and explained

Lowest order 	Changes to a specific element or interventions within sub-FRGA(s)	Key individual changes which are important but that do not impact on the overall sub-FRGA but that might impact upon the type of management activities undertaken or on the outcomes. They may include a change in one element of the PAA or include small changes in how flood risk is managed (e.g. an increase in resources to implement defences).
	Changes to the structure or content of individual sub-FRGAs	This involves those changes in governance at the sub-arrangement level. This may include a more significant change in function or the way in which FRM is delivered and is likely to involve one (or more likely more) elements of the PAA (e.g. the implementation of governance around PPS25 in spatial planning).
	Changes to the structure and composition of the overall Flood Risk Governance Arrangement	This involves changes to the overall governance arrangement for flooding and will include both the introduction of new sub-FRGAs, key changes in relationships between sub-FRGAs or the increase or decrease in significance of sub-FRGA(s) (e.g. the introduction of the Bellwin Scheme for local authority recovery).
	Changes to the flood policy domain and broader changes.	These changes (or aspects of stability) at the very overarching level which may or may not have an impact upon the FRGA or sub-FRGA. These factors are considered to be at a higher level as they may also influence other interconnecting policy domains (e.g. the overall centralisation of flood management (and other government activities) in England).

Both change and stability are observed within English flood risk governance. The primary pattern of change is incremental. The dominance of incremental change in England is in part a function of the framework in which it has developed. Flood risk management has evolved within the context of a Common Law system and the assemblage and (partial) convergence of multiple streams of legislation (including land drainage, water resources development, spatial planning, civil contingency planning, environmental conservation and sustainable development, climate change). Importantly, governance shifts may be characterised by any combination(s) of the elements of the PAA and at one time or another, English flood risk governance change displays evidence of all of these. There are too many incremental changes in English flood risk governance over the period of analysis to present all of them, but figure 2.6 is a timeline highlighting some of the shifts which are considered⁴² to be more significant.

⁴² These critical shifts were discussed, verified and refined following a second project workshop (Micou *et al.*, 2015b).

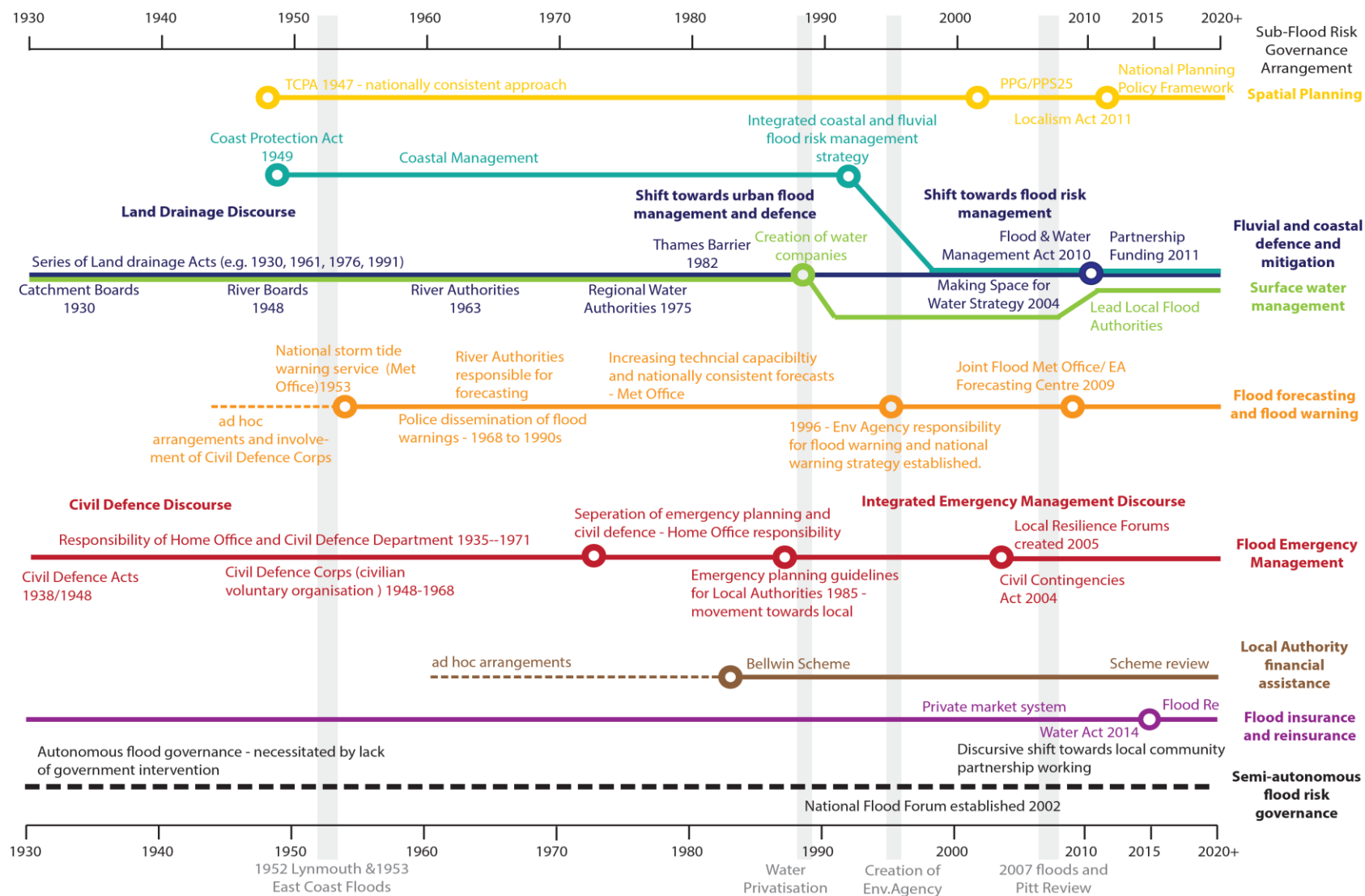


Figure 2.6: Timeline highlighting the key changes to each sub-Flood Risk Governance Arrangement in England

This timeline presents the shifts by sub-FRGA to highlight that the nature of change is such that key changes to each sub-governance arrangement occur at different times. For instance, although the 2007 floods – and the independent review that resulted – can be seen as a driver (or as one of a number of contributing drivers) of changes to different sub-FRGAs, these changes have occurred through different mechanisms and over slightly different timeframes. Recommendations from the Pitt Review (in part) led to the creation of a joint Meteorological Office/Environment Agency Flood Forecasting Centre in 2009; a significant governance change pooling resources and including the joint working of previously more disparate actors. However, other changes such as the movement towards more local FRM and the clarification of surface water flooding responsibilities recommended by Pitt have been formalised and made more consistent through the implementation of legislation; namely the Flood and Water Management Act 2010. Despite this, change cannot be entirely related to flooding in 2007 and the Pitt Review, but also in part to the implementation of the EU Floods Directive and in recognition of existing best practices. Furthermore, even the incorporation into legislation has been insufficient to enable some changes to English FRM to be implemented. The most recent example of this is the implementation of a SUDS approval procedure, the original process of which has failed to obtain wider industry support on a number of occasions and has been subsequently weakened and thus re-envisioned as part of the spatial planning process. These small examples are just some of many which demonstrate the complicated nature of change evident in English flood risk governance and highlight the difference in timing between a driver and a change, the difference in relationships between driver(s) and outcome(s) and the potential differences in the mechanisms of change evident.

The incremental nature of change as highlighted by the timeline makes it difficult to identify key shifts in governance within the overall national FRGA. Nonetheless, **several important trends have been discerned from this analysis and are elaborated further in Chapter 6;**

- Transition towards flood risk management and comprehensive flood risk governance (*e.g.* strengthening surface water flood risk governance and the role of spatial planning);
- Increasing transparency of flood risk management and attention towards the management of future flood risk;
- Increased emphasis on a partnership approach, evident via the discourse of *partnership working*, the introduction of duties to cooperate and the introduction of Partnership Funding;
- Stronger and centralised role of the Environment Agency;
- Inclusion of greater numbers of actors;
- Continued provision of a private-market system of insurance.

This section concentrates on the changes to the national arrangement and its structure over a longer period. Figures 2.7 to 2.10 present four snapshots of the national FRGA to present shifts in the number and composition of the sub-FRGAs over different periods. These figures illustrate that nationally there has been the emergence of a number of new sub-FRGAs (such as for spatial planning, flood forecasting and warning, local authority recovery) all incorporating different functions, rules and actors into flood risk governance. However, in general the composition and content of the FRGA has been relatively stable, with a diverse approach to FRM and all five STAR-FLOOD strategies being present since the introduction of the Town and Country Planning Act in 1947.

There has also been some divergence with the creation of a sub-FRGA for surface water flooding emerging from the core of flood management (where it was largely neglected) following the privatisation of the water industry.

The figures highlight that over the period flood risk governance has diversified with different functions being incorporated into separate sub-arrangements. As such, there has been very little amalgamation of different functions into the same sub-FRGA. This is in part indicative of a framework that evolved incrementally and developed in response to challenges and recognised gaps in governance. Furthermore, in recent years, particularly since the FWMA 2010, there has been a greater strengthening, formalisation and alignment of sub-arrangements which has included the creation of strategies to encourage more coordination, consistency and a more comprehensive approach to flood risk management. The creation of a key actor (the Environment Agency) with roles in most of the sub-FRGAs has in part performed a significant coordinating function (see Section 2.4).

The degree of overlap with other policy domains has increased as the scope of flood management and the flood risk policy domain has broadened. Within sub-arrangements, the English system might also be considered to be diversifying the types of measures that are being utilised for flood risk management. Partly, this related to the introduction of new technologies and innovative approaches (*e.g.* property-scale resistance and resilience measures, radar for flood forecasting), but is also related to the shifting importance of certain types of flooding and the revisiting of measures (*e.g.* flood storage as described in the Hull case study) to tackle them. Despite some additions to the portfolio of FRM measures, the present approach to flood management is not a complete rupture with the past: many measures have been consistently applied (*e.g.* floodplain development control) and, as such, have been utilised for over 100 years albeit not necessarily formally integrated into FRM governance. Indeed, the inclusion of informal governance and flood risk management within the English approach is another consistent feature of the English FRGA, although its importance and functioning has changed over time.

In England, changes to governance arrangements (as defined by the combination of elements in the PAA, as discussed in Chapter 1) have not necessarily resulted from variations in FRM policy. Importantly, there is much debate (*e.g.* Johnson *et al.*, 2005; Scrase and Sheate, 2005) about 'paradigm' or discursive shifts evident in English flood risk management (*i.e.* Land Drainage, Flood Defence, Flood Risk Management). Analysis has shown that these different periods do not always correspond to formal changes in overall governance and particularly do not correspond to overarching changes at the national FRGA level; there may be key lags evident or no change occurs. Thereby, discourse change occurs without any significant changes to resources, rules or actors and consequently changes to flood risk management outcomes have been limited. A further important way of examining governance dynamics is through the primary mode by which flood risk management is delivered. Utilising the conceptual framework and characteristics presented by Driessen *et al.* (2012) (discussed in Section 2.3.9), table 2.14 provides an indicative illustration of the shifts that are evident and highlights that there is a general trend of increasing complexity in the overarching mode of governance in each sub-FRGA, with mixed modes of governance being commonplace.

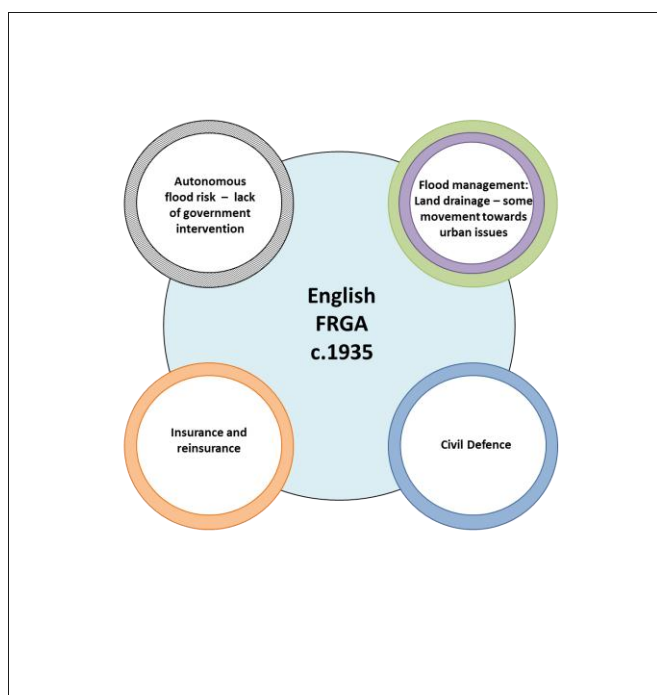


Figure 2.7: The English national Flood Risk Governance Arrangement c. 1935

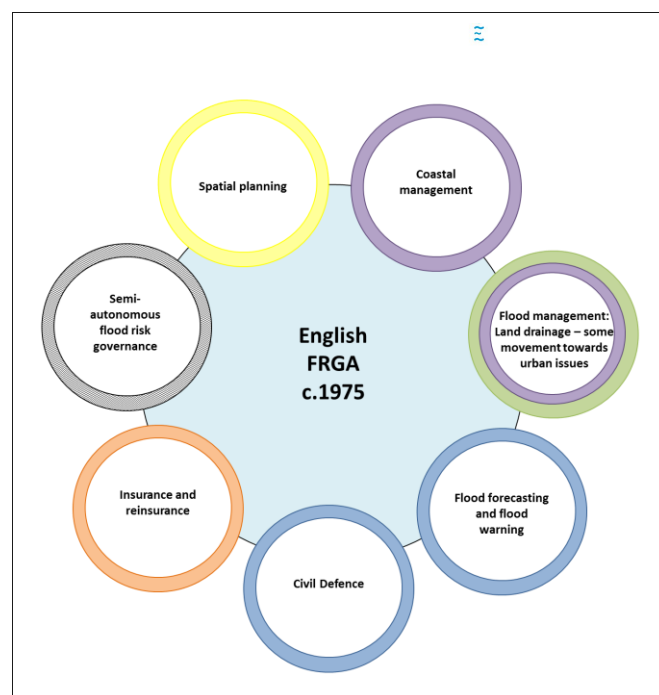


Figure 2.8: The English national Flood Risk Governance Arrangement c. 1975

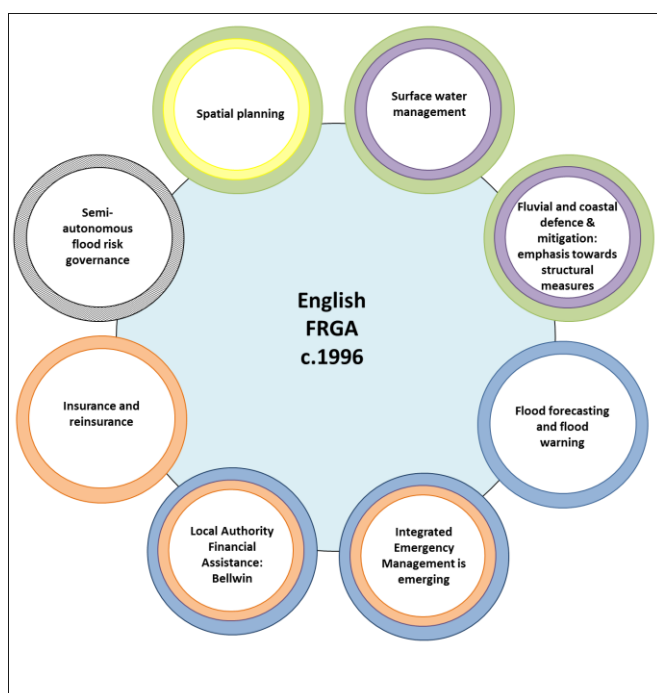


Figure 2.9: The English national Flood Risk Governance Arrangement c. 1996

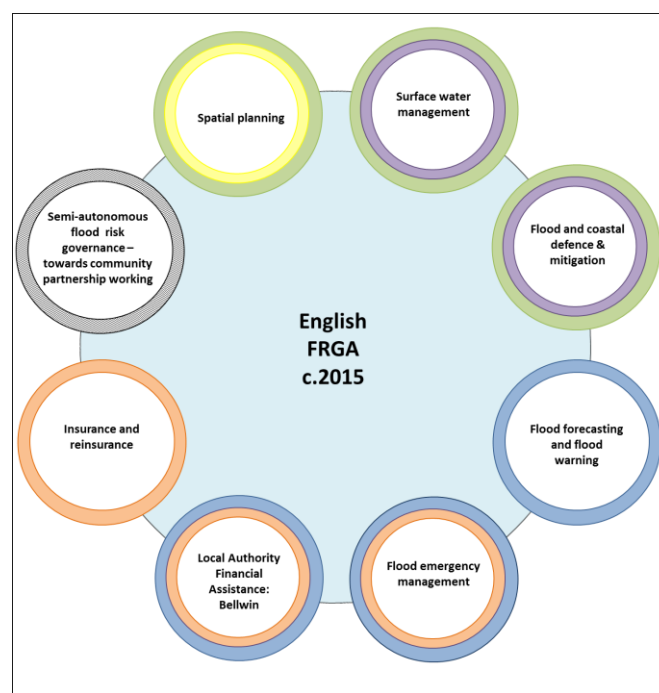


Figure 2.10: The English national Flood Risk Governance Arrangement c. 2015

KEY

- Informal governance arrangement
- Flood policy domain
- Formal sub- governance arrangement

Flood Risk Management Strategies (FRMSs):

- Prevention
- Defence
- Mitigation
- Preparation & response
- Recovery

Table 2.14: Changing modes of governance in sub-Flood Risk Governance Arrangements

Sub-FRGA	Changing modes of governance	
Spatial planning	Decentralised	Decentralised, with aspects of centralised governance
Fluvial and coastal defence and mitigation	Decentralised	Centralised, with aspects of decentralised and interactive governance
Surface water flood management	Decentralised	Decentralised, with aspects of centralised and interactive governance
Forecasting and flood warning	Decentralised	Centralised, with aspects of public-private governance
Flood emergency management	Decentralised	Centralised, with devolved responsibilities based on principle of subsidiarity
Insurance and reinsurance	Public-private governance	Public private governance – but increased governmental involvement
Local Authority recovery: Bellwin Scheme	Decentralised and ad hoc	Centralised
Semi-autonomous flood risk governance	Self-governance (Completely independent) → (Enabled)	

{NB: The table highlights the indicative direction(s) of change in the modes of governance as proposed by Driessen et al. (2012). Their position in the table does not relate to the time when this occurred}.

2.4.2 Explanatory factors for change and stability in English flood risk governance

The dominance of incremental change and changes occurring at different scales (*i.e.* within a sub-FRGA, to the number, structure and alignment of sub-FRGAs or broader changes to the flood policy domain without necessarily changes to governance) means that identifying explanations for change is complex as influencing factors will be multiple, overlap and may emerge over a considerable period. Table 2.15 provides an explanation of governance dynamics within the different sub-FRGAs as well as the critical explanatory factors for change and stability. Whilst there are fewer explanations for stability identified than for the incremental changes that have occurred, this does not mean that it is less important: the significance of stability within the English system cannot be over-emphasised. Explanations for flood risk governance dynamics in England are a mix of factors external to flood risk management (exogenous) as well as those acting internally (endogenous).

Key exogenous factors impacting changes in different ways and at different times are broader strategic, political or governmental changes. A critical example of this for flood risk management was the privatisation of the water industry and the associated creation of water companies. This caused the division between managing different types of flooding, leading to the emergence of a separate sub-FRGA for surface water and a set of new rules, actors, discourses and division of resources. This is one example of where prevailing political ideologies have impacted directly on governance, but others are also evident (*e.g.* general centralisation of financing towards central government, Localism, various broader reorganisations of government including latterly the erosion of ministerial responsibilities) which have directly led to or facilitated change in flood risk governance.

Table 2.15: Key changes evident within sub-Flood Risk Governance Arrangements and proposed explanatory factors

Sub-FRGA	Explanandum	Key explanatory factors for change/stability
Spatial Planning	<ul style="list-style-type: none"> Very stable since the creation of uniform and mandatory national system in 1947. Continued focus of planning implementation at the local level. Key actors have remained very stable although there has been a broadening of those involved. Flood risk was first introduced as a material consideration in 1992. Between 2001 and 2010 there was the implementation of Planning Policy Guidance 25 (PPG25) and then Planning Policy Statement 25 (PPS25), including the sequential test; a greater role for the EA; the introduction of Strategic Flood Risk Assessments and Flood Risk Assessments to inform decision-making. Since 2010, PPS25 has been withdrawn and the National Planning Policy Framework introduced – flood risk remains a material consideration and there is greater emphasis on the local level (with the removal of regional tier of planning, except in London). Changes affecting how flood risks are considered are dominated by rule changes rather than any changes to the institutions or those actors undertaking them. 	<p>Stability</p> <ul style="list-style-type: none"> There has been a consistency of key actors and basic principles (i.e. a local level discursive approach) involved in the planning process which has been mainly responsible for its general stability – other actors have been included (e.g. EA) to provide advice but the core functions of decision-making have rested with the same people. <p>Change</p> <ul style="list-style-type: none"> Broadening of actors is in part a response to normative principles of widening participation in line with broader (exogenous) policies. Planning Policy Guidance 25 can be partly explained as a response to the shock event of the 2000 floods (i.e. endogenous factor), which acted as a ‘<i>policy window</i>’ for change. Technological advancements (both endogenous and exogenous to the FRGA), e.g. in flood mapping and modelling, and the availability of data, created the ability to better assess the potential impact of development in flood risk areas. Move towards a National Planning Policy Framework was related to shifts in political ideology, namely the Localism agenda (i.e. exogenous), as well as broader discursive shift towards local FRM (i.e. endogenous).
Fluvial and coastal defence and mitigation	<ul style="list-style-type: none"> Long period of stability with the land drainage paradigm (1930 to ca. 1980s), marked by increasing centralisation via rule changes. The Coast Protection Act 1949 led to the emergence of a sub-FRGA for coastal management, this was later merged to create the core sub-FRGA of Fluvial and coastal defence and mitigation. Privatisation in the 1980s led to a fragmentation of responsibilities (divided between the National Rivers Authority (predecessor to the EA), local authorities, Highways Agency and water companies) -and with this, the emergence of a distinct surface water sub-FRGA (prompted by exogenous rule change). Creation of the Environment Agency in 1995, whose roles and responsibilities have grown and strengthened to become the key actor delivering flood risk management. Flood Risk Regulations 2009 (implementation of EC Floods Directive 2007) outlines responsibilities for risk mapping and planning. The Flood and Water Management Act 2010 (FWMA 2010) seeks a more comprehensive and integrated approach to FRM, including Sustainable urban Drainage (SUDS). The National Flood and Coastal Erosion Risk Management Strategy for England 2011 fulfils obligations of the FWMA 2010 and emphasises the importance of integrating structural and non-structural measures for sustainable FRM. The Flood and Coastal Erosion Resilience Partnership Funding policy was introduced in 2011 and requires a proportion of funding for defence and mitigation projects to be sourced at the local scale (via private and civil society actors) to complement central Grant-in-Aid. This is impacting on the governance arrangement at a project scale via changing the arrangement of actors and their responsibilities (i.e. prompted via endogenous rule change). Broadening of actors and increasing emphasis on partnership working evident on a discursive level and within rule shifts. Re-emphasis on local scale and community-level involvement in FRM (somewhat re-introducing principles adopted in the 1930s). 	<p>Stability</p> <ul style="list-style-type: none"> Stability has been enhanced by the dominance of the approach of economic prioritisation and latterly the introduction of Cost-Benefit Analysis (this is both an endogenous rule and exogenous rule applied by HM Treasury). Stability is also created by the consistency in the legal responsibility for flooding. The onus remains with the land or property owner to be responsible for flood risk – there is no statutory duty for the government to protect land or property. Past investments and sunk costs maintain some stability in the current sub-arrangement. Power elites and vested interests – the power of the agricultural lobby for many years stabilised the governance arrangement and maintained the focus on land drainage into the 1980s. <p>Change</p> <ul style="list-style-type: none"> Centralisation generally in England, privatisation and Localism are identified as significant (exogenous) rule-shifts which have had an important impact on FRM. Reduction in the importance of agriculture and the related lessening of the influence and power of the agricultural lobby. Significant floods (Lynmouth in 1952; East Coast floods in 1953) highlighted the need for (structural) defences to reduce future risks to life (endogenous factor). Growth of environmental concerns and river restoration movement increased pressure for more environmentally-friendly solutions to flooding (both endogenous and exogenous). Growth in exogenous discourses of climate change and the sustainability agenda influencing current management and the increased focus on future flood risks. Broadening of actors is also in response to normative principles of widening participation in line with broader (exogenous) policies. Externally, the Global Financial Crisis (2007/2008) impacted on the decision to implement Partnership Funding. The Pitt recommendations (Pitt, 2008) following the shock event of the 2007 floods (leading to the FWMA 2010) have impacted the arrangement in a number of ways including the strengthening and clarification of the roles of local authorities, increased focus on surface water events (i.e. endogenous factor). Technological advancements (both endogenous and exogenous to the FRGA), e.g. flood modelling and mapping, have permitted a greater assessment of flood risk and influenced many governance changes within this sub-FRGA.
Surface water management	<ul style="list-style-type: none"> Surface water flood management was neglected within a generic flood management sub-FRGA (including fluvial and coastal flooding) (ca. 1930 – late 1980s). Privatisation essentially fractured responsibilities for FRM and led to a distinct sub-FRGA for surface water flooding. This sub-FRGA has grown in importance following the 2007 floods. The Flood and Water Management Act 2010 included new responsibilities for surface water FRM assigned to Lead Local Flood Authorities (LLFAs); as well as specific legislation related to SUDS Flood Risk Regulations 2009 with roles strengthened at the local level. 	<p>Stability</p> <ul style="list-style-type: none"> Consistent presence of Local Authorities as a key actor. <p>Change</p> <ul style="list-style-type: none"> Increasing urbanisation has created a growing problem of surface water and urban flooding, necessitating greater attention and a governance arrangement. Privatisation of the water industry in the 1980s fractured responsibilities for SWF management (i.e. exogenous factor). The Summer floods in 2007 were an important catalyst for change, and many changes in governance emerged as a result of the Pitt Review recommendations (i.e. endogenous factor). Technological advancements in modelling have supported better understanding of this type of risk and has been needed to direct resources and aid decision-making (e.g. surface water flood modelling and mapping).

Sub-FRGA	Explanandum	Key explanatory factors for change/stability
Forecasting and Flood Warning	<ul style="list-style-type: none"> Forecasting and warning for floods was informal until the 1950s when the national Storm Tide Warning Service was established and operated by the Meteorological Office. The Police had responsibility for disseminating flood warnings from 1968 to early 1990s Responsibilities for warning were assigned to the Environment Agency in 1996. The National Flood Forecasting Service was established following the Easter floods in 1998. The Flood Forecasting Centre (a joint EA and Met Office venture) was established in 2009. 	<p>Stability</p> <ul style="list-style-type: none"> Long period of stability with the responsibilities for dissemination of flood warning being with the police. The nature of forecasting and reliance on technology has created stability, with expertise rooted with key actors e.g. the UK Meteorological Office and Environment Agency. <p>Change</p> <ul style="list-style-type: none"> Governance change has emerged primarily from advancements in forecasting and warning technologies, thus resource shifts can be characterised as a key mechanism for change in this sub-FRGA (i.e. resource-led change). Limited resources and expertise were accountable for changes in responsibilities for disseminating warnings (shifting from the police to the newly created EA in 1996). Significant floods (Lynmouth in 1952; East Coast floods in 1953) led to the establishment of a national Storm Tide Warning Service (STWS) (operated by the Met office) (i.e. endogenous factor). Performance in flood events and the subsequent independent reviews and Select committees have also highlighted inefficiencies and ineffectiveness of warning arrangements (e.g. Bye and Horner, 1998, Pitt review 2008). In particular, the Pitt Review led to the formation of the EA/Met Office joint Flood Forecasting Centre in 2009 (i.e. endogenous factor)
Flood Emergency Management	<ul style="list-style-type: none"> Long period of stability with emergency management framed within the ‘civil defence’ paradigm, from the 1920s until 2002. The Civil Defence Corp 1949-1968 was a voluntary civilian organisation with multiple responsibilities in emergency management and a key actor until their scaling back in the 1960s. Government reorganisation in early 1970s meant Local Authorities were for the first time assigned responsibilities for planning against floods and other natural disasters. The distinction between civil defence and emergency management was clarified further in 1993 when new Regulations tasked Local Authorities to focus on emergency planning (as opposed to civil defence) and to adopt principles of Integrated Emergency Management (IEM). The Civil Contingencies Act 2004 and Civil Contingencies Act (Contingency Planning) Regulations 2005 mark a shift towards integrated emergency management; however there is evidence to suggest that this formalised existing examples of good practice seen in the late 1990s. The new civil contingencies legislation ensures consistency and uniformity across the country. For the first time, it enforced a statutory duty on emergency professionals to collaborate and coordinate activities from a risk-based perspective. 	<p>Stability</p> <ul style="list-style-type: none"> Consistent presence of Local Authorities as a key actor. <p>Change</p> <ul style="list-style-type: none"> External changes to the political context - The ‘civil defence’ frame can be attributed to the socio-political context, reflecting the transition between World War I and II into the Cold War. As these political tensions passed, the Civil Protection in Peacetime Act 1986 enabled authorities to draw from civil defence resources and apply them more broadly. Early changes also relate to resource shifts as the funding for civil defence at the national scale decreased post-WWII and capacity decreased. Best practice-led incremental change driven by experience and lessons learned. Whilst some significant emergencies occurred in England during the 1980s this did not lead to major changes in any aspects of governance. Evidence suggests that the new civil contingencies legislation essentially formalised existing examples of good practice seen in the late 1990s; therefore, formal rule shifts are not key mechanisms for change but follow changes in practice undertaken by actors. Reviews of key flood events in 1998 and 2000 highlighted the ineffectiveness of the current arrangement; however it was not until the 9/11 terrorist attacks in America that legislative change occurred (endogenous and exogenous shock events).
Insurance and reinsurance	<ul style="list-style-type: none"> High degree of stability over the period since flood included as a standard peril in the 1920s. Few formal rules adopted and a stable group of key actors. Increasing interest and concern by the insurance companies about the flood losses sustained and potential losses over this period – particularly since 2000. Movement away from a purely market-based system with the development of Flood Re, an insurance industry led pooled system expected to be implemented by 2016. This has been facilitated by the introduction of new legislation (the Water Act 2014) because of the need for the increased government involvement and regulation, although there were strong attempts to avoid formal rules and legislative changes. 	<p>Stability</p> <ul style="list-style-type: none"> Stability was created by a lack of formal rules, the market driven nature of insurance and the consistency of the key actors. Until recently it has been in the vested interests of the key actors to retain the status quo. <p>Change</p> <ul style="list-style-type: none"> Although generally stable – more attention has been given to flood issues since the 2000 floods and the continued viability of insuring properties in high risk areas under a market based system. The recent movement of change towards Flood Re has been due to a combination of factors including: <ul style="list-style-type: none"> Emergence of new insurance companies and resulting competitive disadvantages (i.e. exogenous); High losses sustained during recent flood events (in particular 2000 and 2007); Technological advances in flood modelling and an increased understanding of insurers’ current and future risk liabilities (in particular the expected impacts and uncertainties of climate change); A shifting balance in the status quo of vested interests – the insurance industry lobbying for change.
Local Authority Recovery: The Bellwin scheme	<ul style="list-style-type: none"> Prior to the early 1980s, LA recovery activities were funded at the discretion of each authority. From 1983 (although formalised in 1989 through legislation) the Bellwin scheme was established to provide some post-flood financial assistance to LAs (and other authorities such as the Police and Fire). 	<p>Change</p> <ul style="list-style-type: none"> Primarily a resource-driven change due to shifts in resource allocation - a consequence of the move in centralisation of funding away from local to national government. Change was driven by increasing concerns about the Local Authorities’ ability (and willingness) to respond effectively to crisis situations.
Semi-autonomous flood risk governance	<ul style="list-style-type: none"> The significance of these arrangements has initially decreased from the early days of flood management with the increasing governmental role in flood management. However, it remained important in those communities who did not receive flood management interventions (e.g. defences, flood warning etc.). Moreover, their significance is beginning to increase due to moves by government and flood risk managers to reinforce flood risk responsibilities at the local level and to encourage input into funding streams. 	<p>Stability</p> <ul style="list-style-type: none"> Stability in the need for independent governance measures has been created by legal responsibility resting with the land/property owner and the prevailing mode of FM decision-making in England (economic prioritisation), i.e. that difficult decisions need to be made and that we cannot manage everywhere. This creates a FRM ‘vacuum’ which in some cases has been filled by these more independent governance arrangements and in others by individual action. <p>Change</p> <ul style="list-style-type: none"> Recent changes back towards the local have been driven by the discourse of Localism (i.e. exogenous) and a lack of resources to undertake flood management.

A further contextual factor leading to fundamental change in FRM was the decline of the agricultural sector (and a reduction in the importance of domestic food production). This changed the direction away from land drainage and the alleviation of flooding in rural areas towards managing flooding in the urban areas where economic benefits were demonstrated to be higher. The ways in which this was achieved however, are significant with the old established approaches not being replaced until powerful elites (who had been successful in maintaining the status quo) had reduced in influence and power (Scrase and Sheate, 2005). A final overarching key factor has been the reframing of flood risk management within broader political agendas (*e.g.* environment, sustainability, climate change). These have fundamentally changed both what is considered important when undertaking FRM, which interventions are suggested, how they are implemented and, significantly increased the consideration of future flood risk (see Section 6.2.3).

One critical series of drivers of governance change include the role of shock events, including both endogenous and exogenous shocks. Exogenous shocks which have impacted on flood risk governance include the Global Financial Crisis, leading to overall cuts in government spending, including that for flood risk management. From an endogenous perspective one critical area for consideration is the impact of past flooding on changes to governance. Analysis here and by other research (Johnson *et al.*, 2005) highlights that it is very difficult to attribute change alone to a particular flood event, and that these ‘crises’ offer only partial explanation of the changes as a whole. However, the role of floods as shock events *is* evident in changing governance and flood risk management practice (in particular the 1953 East coast floods), although alone they often do not drive new change, but create policy windows (Kingdon, 1995) through which change is effected and/or accelerated along an existing path (Penning-Rowsell *et al.*, 2006; Huitema and Meijerink, 2009). Conversely, there are also situations whereby floods, rather than leading to change, have reinforced existing (or past) management options; such as the continued call for dredging in the Somerset Levels following the Winter 2013/2014 floods.

Technological and data improvements in many areas (*e.g.* flood modelling, mapping, radar, forecasting, structural engineering) have been critical for driving change in many of sub-FRGAs at different times (Section 6.2). This might be viewed as being both an endogenous factor (whereby the improvements are driven by increased flood-related data or increased understanding of flood processes) or exogenous (where improvements have been due to increased capacity or speed of computing).

From a stability perspective, key factors reside *within* the flood policy domain, with policy inertia, precedents, sunk costs associated with previous investment, and coalitions of actors working to maintain the status quo, all being strong explanations for slow and gradual change. Over our whole period of analysis there have been few changes to overriding legal responsibilities, with the Common Law concept of Riparian Duties remaining, meaning the land owner retains the obligation for managing their risk. Furthermore, the continued existence of private market insurance, sustained use of economic prioritisation and the long-term presence of a dedicated budget for flood risk management all contribute to governance stability (see Section 2.2). Critically, this funding approach has recently changed from one dominated by yearly allocation to one which operates over a six year time horizon. This fundamental change in resource allocation may have significant impacts upon

flood risk management, both in terms of which interventions are possible, but also having broader implications for governance arrangements.

2.4.3 Key observations

Analysis has highlighted that governance changes are enacted through a complex mix of changes to structure and agency and through different combinations of all elements of the PAA; rules, resources, discourses and actors. Incremental change that dominates is indicative of the way that flood risk management has developed in England over a long period and is seen as a fundamental strength of the approach providing the flexibility to respond to challenges. As flood risk management in England has matured and the system has become highly stable, there has been a general formalisation of flood risk governance and increasing professionalism in FRM. Coupled with this, the broadening of the approach and increasing overlaps with other policy domains has led to more complexity in flood risk governance in a number of ways including: increasing number of rules, broadening the number of involved actors and the introduction of more complicated and mixed modes of governance. Ultimately, this flood risk governance has evolved into a considerable comprehensive approach. Importantly, changes to flood risk management in England do not always require a significant change in governance. This is noteworthy when considering how future changes to flood risk management processes or outcomes may be enacted.

2.5 Evaluating flood risk governance at the national scale

STAR-FLOOD adopts a normative position that flood risk governance should i) enhance societal resilience to flooding, ii) be considered to be legitimate and iii) make use of resources in an efficient way. In order to evaluate the extent to which flood risk governance is achieving these desired outcomes (*i.e.* resilience, legitimacy and efficiency) and address Research Questions 4-6 in Box 1.1, several criteria (and indicators to operationalise these) were identified (Table A2; Alexander *et al.*, 2015b).

This chapter reports the outcomes of evaluation performed at the scale of the national Flood Risk Governance Arrangement (FRGA); however the reader should be aware that further in-depth analysis has been conducted at the sub-FRGA scale and is available in Priest *et al.* (2015). This research is informed through numerous data sources and analytical methods (see Box 1.3, Chapter 1). These results are triangulated with the insights gained through case study research to help identify the strengths and limitations of the current approach to flood risk governance in England (Chapter 7).

2.5.1 To what extent does flood risk governance in England enhance societal resilience to flooding?

Flood risk governance underscores the delivery of flood risk management, from policy and legislation through to its implementation, and the assembly of strategies and measures to manage flood risk (including exposure, the hazard potential and consequences). Governance therefore plays a pivotal role in supporting (or potentially constraining) societal resilience to flooding. This study has discerned three facets through which societal resilience can be assessed; these include the i) capacity to resist flooding (*i.e.* minimise the likelihood and/or magnitude of the flood hazard), ii) capacity to absorb and recover from a flood event and iii) the capacity to adapt (including the capacity to learn, innovate and improve). This section addresses RQ4 (box 1.1).

I. Diversification of measures and strategies enables holistic FRM in England and supports societal resilience by enhancing the capacity to resist flooding, as well as absorb and recover from flood events when they occur.

In contrast to other STAR-FLOOD countries, a key strength of English flood risk governance is that it has enabled a multitude of FRMSs to establish for a considerable period of time (ca. 65 years, as discussed in Section 2.4). National flood policy insists that a portfolio of structural and non-structural solutions are employed, recognising that prevention via flood defence is not always possible or financially viable (Environment Agency, 2015a). Diversity is widely regarded as advantageous, as it addresses flood risk in a holistic way, supporting the capacities to resist, absorb and recover from flood events; as well as creating contingency in case certain measures should fail (Folke, 2006; Priest *et al.*, 2013; Hegger *et al.*, 2014). Moreover, a multi-scale approach to FRM is adopted whereby flood risk is managed strategically at the national scale whilst allowing locally-tailored approaches to emerge. Both the diversity and multi-scale approach enabled by English flood risk governance were highlighted as key strengths, and important characteristics for societal resilience, by the flood risk professionals interviewed as part of this study. Nonetheless, calls to further enhance societal resilience and adaptation continue to be evident in policy agendas (Defra/EA, 2011a). Although this research identified a number of considerable strengths, there are some causes for concern within flood risk governance and the delivery of FRM, which this discussion now turns to.

II. The capacity to *resist* flooding is enhanced by defence infrastructure and supported by the national Investment Plan and Partnership Funding; however, the prioritisation approach for allocating revenue spending to maintain existing defences means the capacity to resist flooding may diminish in some areas.

An important step forward has been the recent introduction of a six year spending programme to manage the risk of flooding and coastal erosion (Defra, 2014b). The Investment Plan allocates £2.3bn of capital spending towards over 1,400 flood defence schemes, with the view that these will improve protection to 300,000 properties and reduce current flood risk by 5% by 2021 (HM Treasury, 2014; Defra, 2014b). This was universally regarded by those interviewed as a significant capital commitment and necessary step in securing and adequately planning for defence and mitigation measures in the medium-term. Moreover, the Investment Plan is closely aligned to the investment profile outlined in the Long-Term Investment Strategy (LTIS), required for sustainable FRM (Environment Agency, 2014a).

Facilitating the capacity to resist, the implementation of Partnership Funding in 2012 (Section 2.3.2; Defra, 2011b), enables more flood defence and mitigation schemes to be developed than in the past (Defra, 2014c). In contrast to the previous system which favoured high-priority schemes, this new approach marks a step-change whereby all schemes are eligible for some funding (depending on the ratio of costs to benefits). Early assessments of this new funding arrangement have documented an increase in external funding, from £13m in 2008-2011 (pre Partnership Funding) to an estimated £140m in 2011-2015 (Efra Committee, 2015); however the difficulties of securing contributions at the local scale and from the private sector is an express concern of flood risk professionals interviewed.

In order to measure the capacity to resist flooding, this research looked to previous flood events. More recently the Winter floods 2013/14 have been described as a ‘test’ of resilience (NAO, 2014) and demonstrated the effectiveness of existing flood defences; indeed, 800,000 properties are

claimed to have been defended against the tidal surge in December 2013 (Environment Agency, 2014b). However, the winter storms also revealed weaknesses in defence and river maintenance. Excluding the £270m of emergency funding from Government, the National Audit Office (2014) reported that the total funding for flood defence maintenance decreased by 10% in real terms between 2010-11 and 2014-15. Although the review of the Winter floods 2013/14 showed 94% of assets in high consequence systems were at target condition (ASC, 2014), asset maintenance in medium and low consequence systems is determined on a priority, cost-benefit basis. Although this approach is necessary for efficiency (Section 2.5.2), it was criticised during and following the Winter floods by affected local communities, interest groups, the media and the Efra Committee (Efra Committee, 2014). It is estimated that almost three quarters of flood defence assets in 2014-15 have not been maintained to their optimum needs (Grant and Chisholm, 2015). Simultaneously, spending on asset maintenance will need to increase in line with rising flood risk (Sayers, 2013). The perceived shortfall in revenue for maintenance work was also a recurring criticism of national flood risk governance. To some extent these concerns are mitigated within the Investment Plan, which incorporates maintenance costs within the whole-life assessment of each scheme (Defra, 2014b). Nonetheless, current Government policy allocates the revenue budget on an annual basis according to risk priorities and several interviewees amongst others (*e.g.* NAO, 2014; Efra Committee, 2015) have called for these budgets to be amalgamated into a total expenditure classification. The merit of this is examined in Chapter 8.

III. There have been considerable efforts to strengthen flood risk governance for surface water flooding following the Summer floods in 2007 and enhance the capacity to resist this type of flood event. Sustainable Urban Drainage Systems (SUDS) are now embedded within spatial planning but it is too soon to evaluate the impact of this.

Flood risk governance in England has witnessed the emergence of a distinct sub-governance arrangement to address the unique challenges posed by surface water flood risk. In response to the 2007 Summer floods and Pitt Review, the Flood and Water Management Act (FWMA 2010) provides a clearer framework of responsibilities for surface water management. Provisions for SUDS are also implemented through the National Planning Policy Framework (Section 2.3.3). On one hand, this was reviewed by some professionals interviewed as a positive step forward. Indeed, given the considerable delays in the development of nationally-agreed standards for SUDS and practical concerns about the formation of SABs (as originally proposed by the FWMA 2010), the recent changes to planning policy mean that sustainable drainage is now a consideration for developments of 10 properties or more. However, mirroring the results from the consultation on SUDS (Defra/DCLG, 2014), there were reservations about the maintenance of SUDS and lack of technical expertise within Local Planning Authorities (LPAs) to judge the appropriateness of different measures and monitor the effectiveness of SUDS as originally proposed. Since this time, DCLG and Defra have identified LLFAs as statutory consultees for planning applications to mitigate these concerns (DCLG, 2015). These changes will strengthen the NPPF, which already promoted the use of SUDS in new developments. Examples of good practice are already evident in England, from which developers could build upon (*e.g.* the Derbyshire Street Pocket Park project⁴³).

⁴³ For further information on the Derbyshire Street Pocket Park project see http://www.susdrain.org/case-studies/case_studies/derbyshire_street_pocket_park_london_borough_tower_hamlets_1.html

Although it is too soon to evaluate the impact of this change in governance, a number of concerns have been highlighted in the literature and by interviewees in this research. Firstly, the extent to which SUDS are successful depends upon the effective implementation of a ‘chain’ of approaches and the development of a series of complementary measures which, when considered as a whole, are able to deliver the reduction of surface water flooding. This raises concerns about the role played by LPAs given that applications will be approved on a case-by-case basis. This could lead to a piecemeal approach to drainage. Secondly, there is now no longer a legal requirement for SUDS and SUDS could be abandoned if the costs are proven to affect the viability of a development. Thirdly, SUDS must be considered for 10 properties or more (as opposed to the original proposal of 2 properties or more); consequently, the cumulative effect of small developments on surface water run-off is not accounted for. This is something which Defra and DCLG plan to monitor (Defra/DCLG, 2014). Finally, the long-term success of SUDS is dependent on an effective maintenance regime. This is intentionally not prescribed in policy so that developers are able to put in place arrangements for maintenance that are best suited to the local flood risk, locality and type of development (Defra/DCLG, 2014). Interviewees expressed concern that this could complicate the distribution of responsibilities, which could lie with the developer, property owner, water company, Local Authority or outsourced service management company.

IV. The exposure of people and property is minimised through spatial planning mechanisms (i.e. the Sequential Test and Exception Test) and planning conditions. This supports the capacity to resist, or absorb and recover should flood events occur. However, development on the floodplain is continuing. More needs to be done to ensure that future development is resilient and adaptive to changes in flood risk.

Flood risk is embedded within spatial planning policy, with mechanisms such as the Sequential Test and Exception Test to regulate development on the floodplain (Section 2.3.1). Planning conditions and building regulations also promote the adoption of mitigation measures, such as SUDS and minimum floor heights according to Flood Risk Standing Advice (Defra, 2015b), local byelaws or specific advice from the EA. Although in theory planning applications can be granted contrary to EA objections, the EA advice is generally followed by Local Planning Authorities (AMEC, 2014; ASC, 2014). The insurance industry also provides an incentive mechanism to minimise development on the floodplain or at least encourage adaptive designs, by excluding properties built after 1st January 2009 (Defra, 2014d).

However, enforcement is a key concern. Enforcement action is currently discretionary and Local Planning Authorities (LPAs) are encouraged to act proportionately when responding to suspected breaches of planning control and consider publishing a local enforcement plan (DCLG, 2012). In reality, few planning applications are refused which is in part because of the general presumption in favour of development⁴⁴. Bell *et al.* (2013; p407) suggest that 84% of all applications are successful. Additionally, during this research, flood risk professionals expressed concerns about the impact of strained resources within LPAs and the EA. It was felt that this could limit the effective enforcement of planning decisions, potentially lead to inappropriate development on the floodplain and circumvent risk in the future. For instance, the EA is committed to commenting on large-scale

⁴⁴ Originally introduced as part of the Planning and Compensation Act 1991 and now s. 38(6) of the Planning and Compulsory Purchase Act 2004.

projects, meaning that minor planning applications in the floodplain do not receive site-specific advice (Grant and Chisholm, 2015). Moreover, evidence suggests that development on the floodplain is continuing (ASC, 2014). Managing flood risk through spatial planning arrangements requires a balancing act with other local and national priorities, particularly the demand for housing and importance of economic development/regeneration. These priorities need not be conflicting and can be delivered symbiotically (see Leeds example in Chapter 5). However, there is an important question about whether more can be done to achieve resilient and adaptive development. Although the Exception Test requires development in vulnerable areas to incorporate suitable adaptation measures, the potential to improve this was debated during the national-level workshop and a range of suggestions were proposed, such as incentivising property owners through grant schemes or insurance mechanisms (discussed further in Chapter 8).

V. The governance and delivery of flood forecasting, warning and emergency management is exceptional and has instilled significant capacity to absorb and recover from flood events.

A key strength of flood risk governance in England emphasised in this study is the strategy for preparation and response. The provision of different forecast products (depending on risk and end user), with up to five days lead time, means there is time to plan the response and provide sufficient time for at-risk communities to initiate damage-reducing actions and safety behaviours. Multiple pathways and means of communicating flood warnings are also sought to maximise the ‘reach’ of warning messages and ensure the inclusion of a range of social groups. Adding to this, an opt-out service for receiving flood warnings was established in 2010 based on an agreement between the EA and telecommunication providers; 660,000 properties are now registered as part of this service. At the same time, figures suggest that the numbers of those actively ‘opting-in’ to the EA’s Flood Warning Direct service has increased (ASC, 2014). Minor weaknesses to this arrangement were identified in this study. For instance, the success of the opt-out flood warning service is limited as fewer landlines are being used by the public. However, the potential to involve mobile providers and issue automated flood warnings to mobile devices is already being trailed in Cornwall and Devon as of July 2015 (Environment Agency, 2015b).

Flood emergency management can also be highly praised and involves a range of activities that not only minimise the risk posed to life, but also encourage behaviours that minimise the damages caused by flooding and in turn prompt faster recovery. Integrated Emergency Management (IEM) is delivered through Local Resilience Fora (LRF), rigorous training and exercising, as well as established protocols for sharing resources, information and identifying vulnerable people (HM Government, 2007; Cabinet Office, 2008; Cabinet Office, 2012b). Responsibilities and arrangements for up-scaling emergency response according to the principle of subsidiarity are also clearly defined to guarantee effective flood incident management (Defra, 2013a). Significant improvements have also been made following the Summer 2007 floods, with the development of the National Asset Register for emergency resources and improvements to national capabilities in terms of new equipment and training for swift water rescue. Furthermore, resilience is embedded in critical infrastructure through business and sector plans to minimise the disruption caused by flood events (Cabinet Office, 2011b). Targeted flood warnings for infrastructure services also allow these organisations to act sooner to ensure business continuity. There are few criticisms of flood emergency management. Efforts to promote business continuity plans in the private sector are occurring, but research suggests that this is highly variable and often developed in larger companies only. Although this has increased from

42% to 58% from 2008 to 2013 overall, smaller businesses appear to be lagging behind (ASC, 2014). This could undermine the capacity to absorb and increase recovery time should a flood occur.

- VI. Considerable efforts have been made to engage local communities in FRM, increase awareness of flood risk and encourage adaptive behaviours (e.g. installation of property level resistance and resilience measures); both to enhance the capacity to absorb and recover, as well as adapt to future flood risk. Whilst there are examples of success (e.g. Defra Pathfinder projects), expectations amongst some groups appear to be at odds with national policy.**

Community engagement is a key activity within FRM to enhance risk awareness and facilitate ownership of flood risk responsibility at the household and community scale. Community initiatives empower local people to adopt measures that will either enhance their resistance against flood events (e.g. property-level measures) or their capacity to absorb and recover (Section 2.3.8). There are also a number of resources available for supporting community-based action, including dedicated community engagement officers within LAs and the EA, as well as support through the National Flood Forum. Online resources have been made available through the Community Resilience Programme to support community-based activities to enhance preparation and response (e.g. Cabinet Office, 2011d; 2011e). This is accompanied by specific flood plan guidance for communities (Environment Agency, 2012b).

Although community engagement and local action is widely regarded in policy and amongst flood risk professionals as a key strength of FRM and supporting societal resilience in the long-term (see Chapter 7), some limitations were identified from this study. Sustaining community interest and motivation can be difficult. Groups typically form in the wake of a flood event and are goal-driven (e.g. lobbying for flood defences); as the period between flood events increases and if goals are achieved, group motivation may dwindle and groups can disband. There is also a tendency to depend on ‘local champions’, who steer and lead the group, yet these individuals can withdraw at any time. These reasons can threaten the sustainability of community action groups. Maintaining flood memories and flood consciousness can also be problematic (McEwen *et al.*, 2012).

Interviewees also expressed the concern that in areas which have not been the focus of community engagement initiatives it seems that is an expectation that RMAs should prevent floods from occurring and have limited awareness of their permissive responsibilities. In the development of the Strategic National Framework on Community Resilience, consultation exercises also highlighted a culture in which people expect immediate support and assistance from the emergency services (Cabinet Office, 2011c). This public attitude is problematic in terms of societal resilience, because it could undermine the public’s motivation and willingness to act to minimise their own risk. Moreover, the fact that responsibility ultimately resides with riparian land and property owners appears to be poorly understood, which could result in the negligence of responsibilities and potentially heighten the flood risk of others.

- VII. Financial recovery mechanisms enhance the capacity to ‘bounce back’, but more should be done to encourage adaptation rather than a return-to-normal model of resilience.**

The capacity to financially recover from flooding is enhanced through two key mechanisms, namely the Bellwin Scheme and insurance. The use of minimum spending thresholds to determine eligibility

to receive financing under the Bellwin Scheme, was introduced to ensure that authorities undertake some contingency planning and set aside a proportion of their budget to deal with emergencies. These regulations and limits on reimbursement are used to encourage local authorities to build-in a degree of resilience and adaptive capacity. Whilst the Bellwin scheme provides a buffer against financial losses, there is some evidence that the Bellwin funds are insufficient and that authorities' costs exceed those recouped (Audit Commission, 2007). Our analysis also highlighted some conflicting issues in terms of fairness, resulting from the way in which the minimum spending thresholds are set for individual councils before a claim can be made under the Bellwin Scheme (Section 2.3.6). This is determined according to the size of the authority, whereby larger authorities are expected to reach higher spending thresholds in order to secure assistance. On one hand, it is a reasonable expectation that larger authorities hold greater sums of money in reserve in comparison to smaller authorities and therefore be required to reach higher spending thresholds before Bellwin assistance is granted. On the other, there is a risk that where significant flood damages have occurred at a specific locality the overall financial impact becomes diluted across a larger area. As a result, large unitary authorities may be disadvantaged (Efra Committee, 2013). This is something that warrants further study.

Financial recovery at the household scale is supported through the high penetration of private market insurance. The introduction of Flood Re will also support the provision of affordable flood insurance in high risk areas (Section 2.3.7). However, an important question was debated during the national workshop about whether more could be achieved through the insurance sector in terms of encouraging the uptake of property-level measures and resilient reinstatement techniques following a flood event; thus moving away from standard reinstatement techniques and the 'return to normal' discourse of resilience that currently dominates. Formal incentive mechanisms to promote risk reduction measures at the property scale are absent from the new Flood Re scheme and there is an unwritten assumption that the transition to risk-reflective pricing in 25 years will incentivise homeowners to invest in such measures in the future. Although price signals have significant potential in stimulating autonomous adaptation (*e.g.* Filatova, 2014), for the time being the flood aspect of insurance will be capped for all high risk households and arguably override the financial incentive for homeowners to reduce their own risk (Surminski and Eldridge, 2014). However, there are informal guidance documents in place that demonstrate the willingness of the insurance sector to encourage adaptive development (*e.g.* ABI, 2009). Moreover, ABI and government are producing a Flood Risk Report template for homeowners to declare resilience measures to their insurance provider (although it is not clear how such measures will be rewarded; Surminski and Eldridge, 2014). Public consultation for the Regulations to implement Flood Re also revealed concern that stronger incentives might be needed to promote risk reduction measures at the property scale or even making property-level products compulsory (Defra, 2014d). In response, the Government stated an expectation for Flood Re to *"set out clear proposals on how it will create incentives for policyholders to take ownership and invest in resilience measures, including through all appropriate financial incentives"* (Defra, 2014d, p9). How this will manifest in practice remains unclear, although it is envisaged that the Transition Plan (to be reviewed and publicised every 5 years) will raise community awareness and enable homeowners to effectively plan for the eventual transition to risk-reflective pricing.

VIII. Adaptive capacity is promoted through i) cultures of institutional learning, ii) knowledge exchange at the scientific-policy interface, iii) adaptive management approaches in the delivery of flood defence measures and iv) forward planning for future risk and climate change. However, continued efforts are required to enhance adaptive capacity at the household and community scale, and normalise adaptation within society.

Adaptive capacity in flood risk governance is necessary to ensure the continuation of effective FRM under uncertain environmental, climate and socio-economic conditions of the future. There are numerous features of English flood risk governance that enhance this. Institutional cultures of learning are well established. For instance, it is standard practice within emergency management to debrief following significant incidents and identify lessons learnt in order to enhance future response capabilities. Research is also highly pursued in an attempt to improve current practice and to build bridges with scientific research and technological advancement (such as the Defra/EA Research and Development programme and grants available through research councils). Furthermore, an online knowledge portal provides learning modules to support capacity building for LLFAs as well as other RMAs (see <http://learning.environment-agency.gov.uk/capacitybuilding/>). Further FRM guidance for practitioners is available from the Local Government Association's 'Flood Risk Portal'.

In terms of flood defence, managed adaptive approaches are increasingly advocated for large-scale schemes (Environment Agency, 2011). This requires the identification of trigger points and managing risk through pre-determined interventions, whilst instilling a degree of flexibility to adjust responses according to changes in conditions; the implementation of the Thames Estuary 2100 project is a good example of this (Environment Agency, 2012c). Future concerns are also integrated within Catchment Flood Management Plans to support strategic decision-making over a 50 to 100 year timescale.

Climate change concerns are not only embedded in FRM, but FRM is also embedded within climate change policy within the National Adaptation Programme and the Climate Change Risk Assessment (as required by the Climate Change Act 2008). Despite these efforts, a recent review by the Environmental Audit Committee criticised the National Adaptation Programme for its failure to acknowledge the significance of flood risk and advocate adaptive property design on a strategic level (Environmental Audit Committee, 2015). This was echoed by flood risk professionals at the local scale, who felt that adaptive responses (namely property-level protection and SUDS) have been slow to emerge in practice. The reasons for this are examined further in Chapters 3-5.

Also discussed was the impact of reactive spending following the Winter floods in 2013/14. On this front, it was asserted that regardless of social and political pressures FRM needs to stand firm in its position towards proactive FRM and risk-prioritisation. This was also regarded as necessary for managing societal expectations about FRM.

2.5.2 To what extent can flood risk governance in England be described as efficient?

Efficient flood risk governance is seen as desirable, especially as FRM is largely funded by those not at significant risk of flooding via public money. Although this is not a necessary condition for societal resilience, there is a strong argument that FRM should use resources in an efficient manner; based on the ratio of some desired output(s) to input(s). This is necessary for delivering sustainable FRM, as is emphasised in national policy. This refers to the importance of delivering socially, environmentally and economically viable approaches to FRM, which meet the needs of the present without

compromising the needs of future generations (Defra/EA, 2011a). Within this research a diverse range of resources were examined, including economic, human (e.g. knowledge, skills and personnel) and technological (e.g. flood risk modelling and mapping). This section addresses RQ5 (box 1.1).

IX. The allocation of capital and revenue spending via Cost-Benefit Analysis (CBA), whole-life costing and risk-based prioritisation encourages long-term cost-effectiveness and economic efficiency.

The principle of efficiency is clearly embedded within the governance process determining the allocation of funding for flood defence and mitigation, as well as the resulting standards of protection provided across the country; thus there are no fixed standards of protection in England. National policy encourages a portfolio of measures to be considered, including measures with direct benefits as well as indirect benefits from ‘enabling activities’ such as flood warning (see the Benefits Assessment Framework outlined by the Environment Agency, 2015a). To determine the allocation of Flood and Coastal Erosion Risk Management Grant-in-Aid (FCERM GiA or GiA for short), Cost-Benefit Analysis (CBA) is used to ensure the greatest value for money. Currently, this decision is based on an 8:1 ratio; with £8 (€10.8) benefit achieved for every £1 (€1.35) of Government spend. According to the National Audit Office (2014), as of March 2014 the Environment Agency had achieved a 9.5:1 cost-benefit ratio. Benefits are determined in terms of the i) benefits for the householder, ii) benefits for business, agricultural productivity and protection of national and local infrastructure, and iii) benefits for the environment (Defra, 2011a,b).

This is widely regarded as a robust and appropriate means of allocating funding. Moreover, the appraisal process is also informed by whole-life costing to determine the most cost-effective approach by taking into account the benefits of alternatives, routine maintenance as well as capital replacement and improvement for the life of the asset (Environment Agency, 2015a; Defra, 2014b). A range of assessment tools exist to support these processes, including the Multi-Coloured Manual (Penning-Rowsell *et al.*, 2013) and FCERM-Appraisal Guidance (Environment Agency, 2010a).

The National Investment Plan (Defra, 2014b) enables medium-term planning and opportunities for RMAs to ‘package’ projects and source competitive prices from suppliers (ASC, 2014; HM Treasury, 2014). In turn, it is estimated that efficiency savings will be made (ca. 10%) that can be reinvested in defence and mitigation projects (Defra, 2014b); thus providing a positive feedback into efforts to enhance the capacity to resist flooding (Section 2.5.1).

X. Partnership Funding has the potential to lessen the financial burden on the State; however at this point in time, Partnership Funding has predominantly resulted from the redistribution of public money rather than private sector contributions.

The introduction of *Partnership Funding* (Section 2.3.2) also encourages cost savings from a State perspective by drawing from other sources to accompany funding from Government (Defra, 2011a). Although a key objective of this funding arrangement was to secure financial contributions from the private sector and local communities, to date it seems that Partnership Funding is largely being delivered through the reallocation and diversification of public sector sources (Defra, 2014c). This is advantageous in terms of reducing reliance on Defra administered Grant-in-Aid, allowing more schemes to be implemented and aligning FRM with other policy agendas, such as economic growth

(as highlighted in Chapters 3 and 5). Delivering multi-beneficial FRM is also advocated in national policy (Defra/EA, 2014a) and emphasised by flood risk professionals during research workshops.

There are some examples of successful partnership working involving the private sector. For instance, Nestlé has contributed £1.65m towards the Lower Dove Flood Alleviation Scheme in Derbyshire, based near its factory at Tutbury (Defra, 2014b; Nestlé press release, 2012). Overall, between April 2011 and March 2015 it is estimated that 25% of financial contributions would have come from the private sector (NAO, 2014). However, Defra's plan to attract £600m from private funders over the six year spending period has been called into question by the Environment, Food and Rural Affairs (Efra) Committee; especially as only £40m of the £148m secured to date has come from sources beyond local government (Efra, 2015). Whilst local investment is crucial, Defra acknowledges public sector contributions could be reduced with continued public sector funding cuts (Defra, 2014c). Local Authorities interviewed as part of this research also expressed concern about raising local funds (discussed in Chapter 4). Attracting funding from the private sector is a key objective, but this requires better understanding of the factors that motivate different types of private organisations. In England, the *Income Tax, Trading and Other Income Act 2005* (as amended) outlines provisions for tax relief for businesses contributing to Partnership Funding (HM Government, 2015); however, the fact that private sector contributions remain limited suggests that this in itself may not be a strong incentive. Despite the growing demand and expectation that the private sector should fill the shortfall in the defence budget, these factors remain poorly understood. Moreover, there is no coherent strategy for incentivising private sector involvement. Chapter 8 considers how these concerns might be addressed to strengthen this aspect of flood risk governance and deliver partnership approaches to FRM.

XI. Resource efficiencies have been created through institutional restructuring and duties for cooperation between Risk Management Authorities and other professional actors.

The efficiency of flood risk governance has improved through institutional restructuring, within and between key actors. For instance, the establishment of the Flood Forecasting Centre (FFC) has improved the previously fractured governance arrangement as well as the efficiency and effectiveness of flood forecasting (as highlighted by Pitt, 2008), and was regarded by those interviewed within the Flood Forecasting Centre as a significant step-change. Restructuring has also occurred internally within the EA towards a simplified structure; as a result of this, the EA claims to have reduced administrative costs by 33% (Defra, 2014b). According to some interviewees, changes in the EAs operating structure have been largely driven by budget cuts in response to the financial recession. In light of this, there has been concern (prompted by the Winter floods 2013/14) that job losses within the EA would have a detrimental impact on frontline services and current levels of flood protection. Indeed, staffing levels were reduced following the 2010 Spending Review by 800 in total, half of which were involved in asset maintenance and response to flood incidents (Grant and Chisholm, 2015). The EA have assured that this will not impact front line services and plans to deliver 15% efficiency savings through more effective working, reductions in contract costs and efficiency savings in the capital programme (Bennett and Hartwell-Naguib, 2014).

The increasing emphasis on more effective and joined-up working between RMAs is widely apparent from the policy analysis and interviews conducted. Duties to cooperate and share information (*e.g.* Flood and Water Management Act 2010, Localism Act 2011 and Civil Contingencies Act 2004) can be

interpreted as a strategy to enhance efficiency within flood risk governance. Indeed, following the 2007 Summer floods, the Pitt Review commented that the lack of incentives to work together resulted in investment decisions being made in isolation, which at best led to inefficiencies and at worst led to increases in the risk of flooding. Since then, new duties for collaboration have been introduced. In spatial planning, the Duty to Cooperate has to some extent compensated the loss of the regional tier of plan development and has improved the efficiency of the planning system (DCLG, 2011b; Begg *et al.*, 2015). Duties to collaborate within the FWMA 2010 were regarded by interviewees as effective and improving relationships between RMAs. Existing mechanisms for coordination and collaboration between emergency responders established in the CCA 2005 and CCA Regulations 2005, (*e.g.* Local Resilience Fora, protocols for data sharing and mutual aid agreements), were also emphasised by emergency professionals as successful in terms of enhancing the efficiency and effectiveness of flood incident management.

XII. The potential to apply cross-sectoral Catchment-Based Approaches (CaBA) currently encouraged in water and environmental policy is debated in FRM. Further evidence is required to demonstrate the effectiveness of this approach for alleviating flood risk and its potential for maximising the efficient use of resources.

In English flood risk governance river catchments have long been employed to inform strategic decision-making in FRM; from the formation of Catchment Boards under the Land Drainage Act 1930 to the development of Catchment Flood Management Plans (CFMP) we see today (Environment Agency, 2012d). The potential to extend this approach and align FRM to other types of decision-making was debated by flood risk professionals who attended the national-level workshop conducted within this study (see Micou *et al.*, 2015b). During this workshop there was a consensus that FRM should not be treated within a silo or as a discrete problem. Instead, it was argued that aligning FRM to different policy agendas and land use decision-making could unlock additional funding streams and help deliver schemes with multiple benefits; thereby enhancing cost-effectiveness and sustainability.

Achieving multiple benefits from single schemes is advocated in the national FCERM strategy (Defra/EA, 2011a) and Defra's policy framework for integrated CaBA to improve the quality of the water environment (Defra, 2013c). To deliver this, Natural Flood Management (NFM) has been increasingly encouraged and includes measures such as wetland creation, tree planting, and river restoration. This has the potential to deliver wider economic, social and environmental benefits, as well as meeting the requirements of the Water Framework Directive 2000, Natural Environment White Paper 2011 and Biodiversity 2020. Examples of good practice are already in place (*e.g.* the Sustainable Catchment Management Programme⁴⁵; Natural England, 2009). Nationally, Catchment Partnerships have already been established in England to inform River Basin Management Plans (as required by the Water Framework Directive) and it is envisioned that such partnerships could support other Defra policy objectives and play a strategic role in land use planning in the future (Defra, 2013c).

Allied with the debate of CaBA is the notion of Payment for Ecosystem Services (PES), this is defined as the payments made by beneficiaries (*e.g.* individuals, communities, business or government) to

⁴⁵ For further details on the SCaMP project see <http://corporate.unitedutilities.com/scamp-index.aspx>

managers of land or other natural resources in exchange for the provision of specified ecosystem services (Defra, 2013d). Flood risk regulation is one such service. For example, the *Slowing the Flow* project in Pickering, North Yorkshire, is trialling land management measures (e.g. woodland creation, restoring wetlands and low-level flood storage bunds) in the attempt to slow and store water in the upper and middle sections of the catchment, thus reducing flood risk⁴⁶ (Defra, 2013d).

Although this approach appears promising, and Defra has developed an action plan for developing PES (Defra, 2013e) and a best practice guide (Defra, 2013d), this is yet to be widely implemented (POSTNOTE, 2014). Research conducted within the Flood Risk Management Research Consortium (FRMRC) furnished contradictory findings regarding the success of rural land use management measures. Whereas small-scale studies revealed significant reductions in peak flood flows and flood volumes, these effects appear to diminish as the scale of the catchment increases (McIntyre and Thorne, 2013). Predicting the hydrological impacts of rural land use change is challenging (Wheater and Evans, 2009). Overall, the evidence is constrained by difficulties in quantifying and correlating the effects of land use change to flood risk reduction, as well as the considerable uncertainty attached to modelling research and up-scaling research findings (Natural England, 2009). During the course of this research a number of practical constraints and other barriers to delivering CaBA were also discussed by interviewees. Firstly, there is a lack of methods to support cross-sectorial cost-benefit analysis to support applications for funding integrated schemes. Furthermore, the benefits of certain measures can take a considerable time to emerge and can be difficult to quantify, this can inhibit funding which often demands high levels of outcome certainty (POSTNOTE, 2014; Natural England, 2009). Thirdly, concerns were expressed by some interviewees about the practical challenge of collaborative working, which can be time-consuming and resource intensive, potentially slowing the delivery of CaBAs. Fourthly, institutional structures can limit investment from certain actors. For instance, research conducted by Indepen (2014) highlights the potential barrier created by water regulation and the need to shift the focus away from absolute standards and narrow outputs, towards a focus on positive environmental outcomes. This is exacerbated by the absence of financial incentives to promote CaBA and maximise cross-sector benefits (Indepen, 2014). Despite these concerns, there is an emerging policy vision towards integrated CaBA and clear scope for exploring the potential of cross-sectorial CaBA and its interaction with flood risk governance. However, further empirical research is required to examine this potential further.

2.5.3 To what extent can flood risk governance in England be described as legitimate?

Ultimately flood risk governance should be conducted in a legitimate way. This assessment is operationalised via several criteria, including *social equity, accountability, transparency, participation, access to information, procedural justice* and *acceptability* (see Table A2, Annex). This section addresses RQ6 (box 1.1).

XIII. The distribution of flood risk is inherently unfair, but there are mechanisms in place to support social equity and deliver fair flood risk management in terms of the distribution of resources and provision of flood insurance.

In the assessment of social equity this research examined both the distributional effects and procedural aspects of flood risk governance (the latter of which is discussed in the next section). Social equity is attached to discussions of fairness and whether the decision-making processes in

⁴⁶ *Slowing the Flow* project in Pickering, North Yorkshire see <http://www.forestry.gov.uk/fr/slowngtheflow>

flood risk governance result in outcomes which can be *considered to be fair* (although not necessarily equal). Johnson *et al.*, (2007) reviewed how three fairness (or ‘justice’) principles are embedded in English FRM, including the examination of *procedural equality*, alongside the distributional justice principles of *Rawl’s Maximum Rule* and *Maximum Utility*. Building on this earlier study, this research highlights how changes in the allocation of FCERM Grant-in-Aid (via Partnership Funding) have resulted in some shifts in underlying fairness principles. The previous funding arrangement directed tax payers’ money towards schemes that maximised economic efficiency; this was the underlying norm upon which fairness was determined (Johnson *et al.*, 2007). From this perspective, Penning-Rowsell and Pardoe (2012) show that there are more ‘losers’ than there are ‘winners’ in terms of those who pay for FRM but gain nothing. This is shifting to some extent with Partnership Funding as those at risk of flooding (as the direct beneficiary) must also make a financial contribution to defence and mitigation schemes. This approach enables Grant-in-Aid to be allocated across a wider range of smaller projects, as opposed to a few high-value projects (NAO, 2014; Defra, 2014c). From the perspective of those at risk of flooding, this can be considered a fairer approach as (in theory) at-risk communities have an equal opportunity of implementing schemes, provided that local sources of funding are secured.

Whilst the policy may be regarded as a more equitable approach, there is evidence to suggest that achieving partnership funding may be easier in some communities, particularly those with high social capital, compared to others (*e.g.* River Thames Scheme, Chapter 4). In an attempt to minimise potential inequities, the funding calculation incorporates the Index of Multiple Deprivation (IMD; DCLG, 2010), building on social vulnerability and environmental justice research (Fielding and Burningham, 2005; Environment Agency, 2006; Walker and Burningham, 2011). Under this new approach, households within different deprivation bands will qualify for funding on a sliding scale; *i.e.* the top 20% and 21-40% deprivation bands will qualify for 2.25 and 1.5 times higher (respectively) than the amount available to non-deprived households (Defra, 2011b). This means that schemes initiated in areas of high deprivation have a greater likelihood of Government funding. Recent research shows that between April 2011 and September 2014, 19,974 households in the 20% most deprived areas had been moved to moderate or low risk categories for fluvial and coastal flooding following investment in flood defence (England and Knox, 2015).

Deprivation aside, concerns have been raised about the urban bias and inequalities that could arise in rural areas due to the lack of potential funding partners and low prioritisation of agricultural land (Begg *et al.*, 2015; England and Knox, 2015). Whilst this concern was also expressed by interviewees, Defra’s evaluation of Partnership Funding actually shows that Partnership Funding has enabled more rural schemes to go ahead (Defra, 2014c). Regardless of this, key actor groups and coalitions have argued the need for the EA to reassess its scoring system. Indeed, the Efra Committee (2013) recommends that the EA place a higher value on agricultural land and its importance for UK food production. The preference towards the protection of people and property over business and agriculture reflects normative values in society and further research is required if these are to be re-evaluated. Furthermore, this must be balanced with the necessity to maximise the efficient use of resources, especially given the current climate of austerity and budget cuts.

Overall, it is clear that there have been commendable attempts within funding arrangements to facilitate social equity. However, there have been recent examples where public money has been

allocated for defence work outside the realm of FCERM policy and the Partnership Funding approach. Certain interviewees voiced the opinion that the Winter floods 2013/14 demonstrated ‘those who shout the loudest’ are able to assert their demands through political networks and the media. In the case of the Somerset Levels this resulted in the rapid creation of a long-term flood action plan (developed within 6 weeks of the flooding) and £10m funding from central Government for dredging and repair work, without a formal cost-benefit analysis and irrespective of expert advice (Efra Committee, 2014; NAO, 2014; England and Knox, 2015). It is still too early to fully understand the impact of the knee-jerk reaction from central Government and the precedent that this has perhaps now set.

Debates about social equity were also evident in our analysis of the Flood Reinsurance (Flood Re) scheme. Prompting this debate was the recent inclusion of the council tax Band H (*i.e.* properties with the highest market value). Band H was originally excluded because it was felt that property-owners in this Band would be able to subsidise the cost of rising insurance premiums. However, this was challenged on the grounds that these property-owners could be left in a situation where flood insurance is unfordable (Defra, 2014d). Certain interviewees expressed dissatisfaction with this decision that high-income households would benefit from a premium cap. At the same time small businesses, leasehold properties, and properties owned by buy-to-let landlords are excluded from the scheme, despite 56% of those involved in public consultation arguing for their inclusion. Arguments supporting their inclusion included i) leaseholders’ lack of control over freeholders⁴⁷, ii) the potential impact on housing stock if landlords are unable to afford rising premiums and iii) impact to small businesses. With regards to the latter, Defra has commissioned research to monitor the domestic and commercial insurance market, and will consider options if evidence emerges to suggest a detrimental impact on small businesses.

XIV. Procedural equity and access to procedural justice is delivered in flood risk governance arrangements in England.

Procedural equity is understood as the fairness in flood risk governance in terms of the processes which shape decision-making and allocate resources. One indicator to assess this is the administration of justice, involving the ability of the public to challenge decision-making and hold professional bodies to account. In England, a range of legal proceedings can be initiated. In the common law of Torts, remedies to perceived injustices can be sought through claims of private nuisance (*e.g.* Marcic v Thames Water Utilities 2003); public nuisance; or negligence. Public bodies may also be subject to judicial review (*e.g.* Manchester ship canal company Ltd v Environment Agency 2013). There are a number of issues raised by court challenges relating to the accessibility of this process; for instance the financial costs involved and restrictions being made to legal aid in England (Gray, 2013). This means that in practice, there exist social inequities in terms of accessing procedural justice.

Procedural equity is evident in sub-governance arrangements within the national FRGA. In spatial planning, development (including development on the floodplain) continues to be assessed within a nationally consistent decision-making framework, following PPS 25 (Johnson *et al.*, 2007) and now

⁴⁷ Freeholder and leaseholder refer to two legal forms of home ownership. Whereas the freeholder owns the building and land it stands on outright, a leaseholder enters into a lease with the freeholder for a specified period of time, only (typically 90-120 years).

implemented through the National Planning Policy Framework. In the sub-FRGAs for fluvial and surface water flood management, procedural equity has arguably been enhanced by the introduction of Partnership Funding.

With regards to flood insurance, the cross-subsidisation of flood risks between areas of high and low risks raises questions about whether it is fair for those at lower risks to be effectively paying for those in high risk areas. This is made more explicit under the new Flood Re system. However long-term, Flood Re will support a transition towards risk-reflective pricing and will replace the current informal cross-subsidy in the market between those at low and high risk of flooding. This reflects a broader shift towards a ‘beneficiary pays’ culture in England and growing opinion that this is a fairer way of pricing insurance premiums, as well as allocating resources in other aspects of flood risk governance. This view was evident amongst flood risk professionals who participated in this research.

XV. Transparency and accountability in flood risk governance is enhanced by independent reviews and public scrutiny of FRM and responses to significant flood events. There is a need to exercise caution to ensure that this does not create a ‘scrutinising culture’ that unfairly attributes blame.

Contributing positively to the evaluation of legitimacy, frequent reviews by Parliamentary Committees and the National Audit Office, as well as external reviews such as the Pitt Review, help to enhance transparency and accountability. Local scrutiny boards are also established under the Flood and Water Management Act 2010 to evaluate local FRM strategies; albeit, there is evidence to suggest that this is lacking in some parts of the country (ASC, 2014). Ultimately, these mechanisms create pathways for institutional learning and improving current flood risk governance and practice. As discussed in Section 2.5.1, this is a necessary feature for enhancing adaptive capacity.

A potential drawback to this ‘scrutinising culture’ is the tendency to unfairly attribute blame. This was highly prominent during the Winter floods 2013/14 when even the Secretary of State for Communities and Local Government attacked national policy and the Environment Agency by saying *“we made a mistake, there’s no doubt about that and we perhaps relied too much on the Environment Agency’s advice...we thought we were dealing with experts”*. Participating professionals in this study raised their concern with such responses; not only is it unconstructive, but has implications for managing societal expectations, as well as a detrimental impact to the morale of the acting bodies who are ‘named and shamed’. Indeed, there is an argument that the localisation of risk responsibility is a means of shifting the locus of responsibility and blame away from central government (Penning-Rowsell and Johnson, 2015). However, on this front it is necessary to observe that whilst responsibilities have devolved, this has not necessarily been accompanied with the devolution of power (Begg *et al.*, 2015; Penning-Rowsell and Johnson, 2015).

As previously mentioned, there are examples whereby the decision to allocate resources to certain communities has lacked transparency; for instance, the River Thames Scheme received an additional £60m from the Autumn Statement in 2014 (see Chapter 4). This not only undermines national policy and perhaps even creates a perverse incentive to not raise funds at the local level, but also undermines transparency in flood risk governance more broadly. Community and political pressures will always prove influential in decision-making processes, but more is needed to ensure that these are made publically apparent.

XVI. Public consultation and participation is well established and a growing momentum in flood risk governance in England.

Within national flood risk governance there is a discernible shift towards a ‘civic model’ in policy-making and delivery, evident through the increased emphasis on public consultation, engagement and empowerment of local communities (Nye *et al.*, 2011; Defra/EA, 2011a). All new legislation and policy is open to public consultation, the results of which are publically reported and used to revise the document under scrutiny (*e.g.* DCLG, 2014d). It is clear that public consultation is not simply a tick box exercise, but is a highly valued part of the decision-making process. Additionally, consultation occurs at the catchment and local scale in regards to flood risk management strategies (*e.g.* Catchment Flood Management Plans). Whilst the potential for wider forms of participation were debated during the national-level workshop, ultimately the consultation approach was regarded as a practical necessity and useful means of canvassing a broader and representative range of opinions.

Within legislation there are duties to *consult* the public (*e.g.* Flood Risk Regulations 2009, Flood and Water Management Act 2010), as well as requests within the *National Flood and Coastal Erosion Risk Strategy* (Defra/EA, 2011a) for Risk Management Authorities (RMAs) ‘*to work in partnership with communities*’. These documents are not prescriptive about how consultation or ‘working with communities’ should be achieved; thus providing flexibility for methods to develop in an appropriate way, tailored to local conditions. Efforts to engage local communities have been increasingly encouraged (*e.g.* Defra, 2012a; Section 2.3.8). Such initiatives represent attempts to prompt bottom-up activities and ownership of flood risk amongst at-risk communities. This is regarded in FRM as a necessary step forward, but there are some potential shortcomings, relating to the representativeness of local community groups, constraints on expertise and capabilities, as well as the sustainability of such initiatives. Variation in flood experience and perceptions of risk mean that the formation and success of community flood action groups is variable across the country. From the national-level workshop, it also became clear that resource constraints are another factor that limit the roles of community engagement officers within the EA and LAs.

XVII. Flood risk information is publically available; this enhances transparency in flood risk governance, as well as raising public awareness of flood risk and management decisions.

Rules in flood risk governance advocate an open and transparent approach to FRM, whereby all stakeholders have equal access to information. Correspondingly, a range of flood risk information is publically available; for example, flood mapping from all sources is easily accessible online via the EA website. Improvements in the visualisation of flood modelling data and user-interfaces to facilitate ease of use and better understanding of flood risk (and uncertainties), is commended by the National Audit Office (2014). Under the FWMA 2010 LLFAs have a statutory duty to consult the public and other RMAs about the local FRM strategy, publish the strategy and issue guidance about how this will be applied in the local area. In theory, local strategies will be publically available, but there have been clear delays. According to the Adaptation Sub-Committee (within the Committee on Climate Change) progress report (ASC, 2014) many local FRM strategies have yet to be published (indeed only 5 out of 152 LLFAs had published these as of 2014). More broadly, the National Audit Office (2014) commented that local communities appear to lack information about defence maintenance. In particular, the de-prioritisation of maintenance in some areas and implications for flood risk, are poorly understood and must be communicated better in the future (NAO, 2014).

XVIII. Public acceptance of flood policy at the national scale is constrained by poor understanding of flood risk, and the permissive powers of Risk Management Authorities, amongst some groups in society.

A final aspect of legitimacy that was evaluated in this research was the *acceptability* of FRM decisions. This is a difficult criterion to quantify and is largely based on the informed perceptions of flood risk professionals. According to some interviewees, the social acceptability of risk appears to be dwindling and with this there is an expectation that the State should prevent floods from occurring. Recent media coverage of the Winter 2013/14 floods also seemed to reveal a public discord with FRM in some areas. Therefore, there is a clear need to manage societal expectations and improve public understanding of flood risk, risk responsibilities and the ‘living with water’ philosophy advocated in national policy. Indeed, the fact that there is no statutory right to flood protection in England reflects a normative perception of floods as ‘acts of God’ that cannot always be prevented (Scrase and Sheate, 2005). Whilst this has been embedded in law, it is not always understood by all members of society. There is a need to better communicate the ‘living with water’ philosophy and the necessity of diverse approaches in order to deliver social, economic and environmentally sustainable FRM. This was further highlighted by a recent public enquiry into flood resilience, which stressed the importance of open and honest public debate and engagement (House of Commons, 2015).

2.6 Conclusions

This chapter has presented an in-depth analysis of flood risk governance at the national scale. The main conclusions can be summarised as follows;

- Flood risk governance in England is characterised by a complex arrangement of actors, responsibilities and mixed modes of governance (including centralised, decentralised, public-private, interactive and self-governance, see Section 2.3.9). Through this governance arrangement a comprehensive and holistic approach to FRM is delivered, whereby all FRM Strategies are regarded as equally important in managing the increasing risk of flooding.
- There is a trend towards greater alignment between sub-governance arrangements, which has developed through a range of bridging mechanisms and processes (Section 2.3.10).
- Flood risk governance is dominated by incremental changes that are steered through exogenous and endogenous factors (Section 2.4). As flood risk management in England has matured, the system has become highly stable and there has been a general formalisation of flood risk governance. A key observation is that changes in FRM do not necessarily require a change in governance; the in-built flexibility and adaptability of the English system are positive elements that require consideration when designing potential changes to flood governance.
- There are considerable strengths of this system in terms of enhancing societal resilience to flooding (Section 2.5.1), economic and resource efficiency (Section 2.5.2) and the legitimacy of flood risk governance (Section 2.5.3). On the whole, the English FRGA is moving towards a more resilient and adaptive approach.

From this national-level analysis a number of themes were identified for further examination at the case study scale, as follows;

- The implementation of surface water FRM (examined primarily in Chapter 3);
- The impact of *Partnership Funding* in efforts to secure funding for defence and mitigation schemes (as outlined in Section 2.3.2);
- Opportunities and barriers to *integrated/partnership working* and strategies for delivering this national-level discourse at the local scale;
- The extent to which locally-tailored FRM measures are able to develop;
- Evidence of innovation and experimentation necessary for enhancing adaptive capacity at the local scale; considering the opportunities and barriers to this.

3 Exploring efforts to integrate surface water mitigation within a defence-reliant regime: A case study of flood risk governance in the Hull & Haltemprice catchment

3.1 Introduction and scope of the analysis

This chapter summarises the main findings from empirical research conducted within Kingston-upon-Hull (henceforth referred to as Hull). Key socio-demographic and physical characteristics of the city are summarised in table 3.1. This research examined the ways in which mitigation measures are being incorporated within a traditionally defence-dominated approach to FRM, focusing on the development of Flood Alleviation Schemes (FAS) on the outskirts of the city. Several FAS are currently in different stages of design, consultation and construction; the most advanced of which is the Willerby and Derringham Flood Alleviation Scheme (WaDFAS). These projects require close collaboration between the neighbouring Lead Local Flood Authorities (LLFAs) of Hull City Council (HCC) and East Riding of Yorkshire Council (ERYC) where the flood storage lagoons are located. Drawing from in-depth policy and legal analysis, and semi-structured interviews with flood risk professionals (see Table A1, Annex), this study provides insights into the opportunities and challenges of integrating surface water mitigation within a defence-reliant regime.

Table 3.1: Key characteristics of the Kingston-upon-Hull case study

Key facts and figures	
Region and county	Yorkshire, North East England
City population	256,406
Population density	35.9 persons per hectare
Elevation	2 – 4m above sea level
River basin	River Hull, 63approx. 980km ² Confluence with the Humber estuary
Properties at risk from a 1% flood (excluding presence of flood defences)	c. 44,000 properties
Types of flooding	Fluvial, tidal and surface water
Index of Multiple Deprivation (where 1 indicates the highest level of deprivation, out of a possible 326 local authority areas)	Hull Local Authority is ranked on average as 15 th

3.2 Contextual background of the case study

Kingston-upon-Hull is located on the East coast of Northern England in the county of Yorkshire (figure 3.1). Situated at the confluence between the River Hull and the Humber Estuary, and developed on reclaimed marshland, the city occupies a naturally low basin where almost 90% of the land is below the level of the normal high tides and only 2-4m above sea level (Environment Agency, 2010b). Thus the area has been described by some interviewees as a ‘mini Netherlands’. Hull is naturally very susceptible to several different types of flooding; namely tidal, fluvial and surface water.



Figure 3.1 Kingston-upon-Hull and the River Hull catchment

Source: MarCom-Carto – Faculty of Geosciences –Utrecht University

Within the (fluvial) River Hull catchment a distinction is made between the *high level system* and the *low level system*. The High level system in the upper part of the catchment, transports water from springs and brooks south along the River Hull into low-lying land. In order to constrain water within the channel, the system is dependent on a series of embankments, which essentially increase the height of the river level far above the surrounding land (Environment Agency, 2010b). As a result, water flowing off the surrounding land is prevented from draining naturally into the river. Instead, a *low level system* of channels or drains has been constructed to convey water to areas where it can discharge into the Humber Estuary or else be pumped back into the high level system with the support of pumping stations. Ownership of these drainage assets is divided between a number of competent authorities, including the Environment Agency, Internal Drainage Boards and Yorkshire Water. Through the city itself, the River Hull is fully embanked and offers protection against the 1 in 100 year flood event. In addition, the Hull Barrier built in 1980, prevents water from the Humber

Estuary from entering the river in the event of exceptional high tides or storm surge, and is designed to withstand the 1 in 200 year flood event.

These defences were tested by a storm surge in 2013. Although 19,000 properties were successfully defended, some defences were dangerously close to being overtopped and breaches occurred along Victoria Dock and the marina in the east of the city (HCC, 2014a). In total 264 properties and businesses were affected. Since this time, investment has been made to strengthen defences in this area of the city, including a new flood wall at Albert dock as well as 600m of raised defences within the Port of Hull. When completed it is anticipated that these defences will protect up to 300 homes and businesses. Assuming that no defences are in place, 47,000 properties are exposed to the 1% fluvial flood and this could rise to 63,000 in the future (figure 3.2; Environment Agency, 2010b).

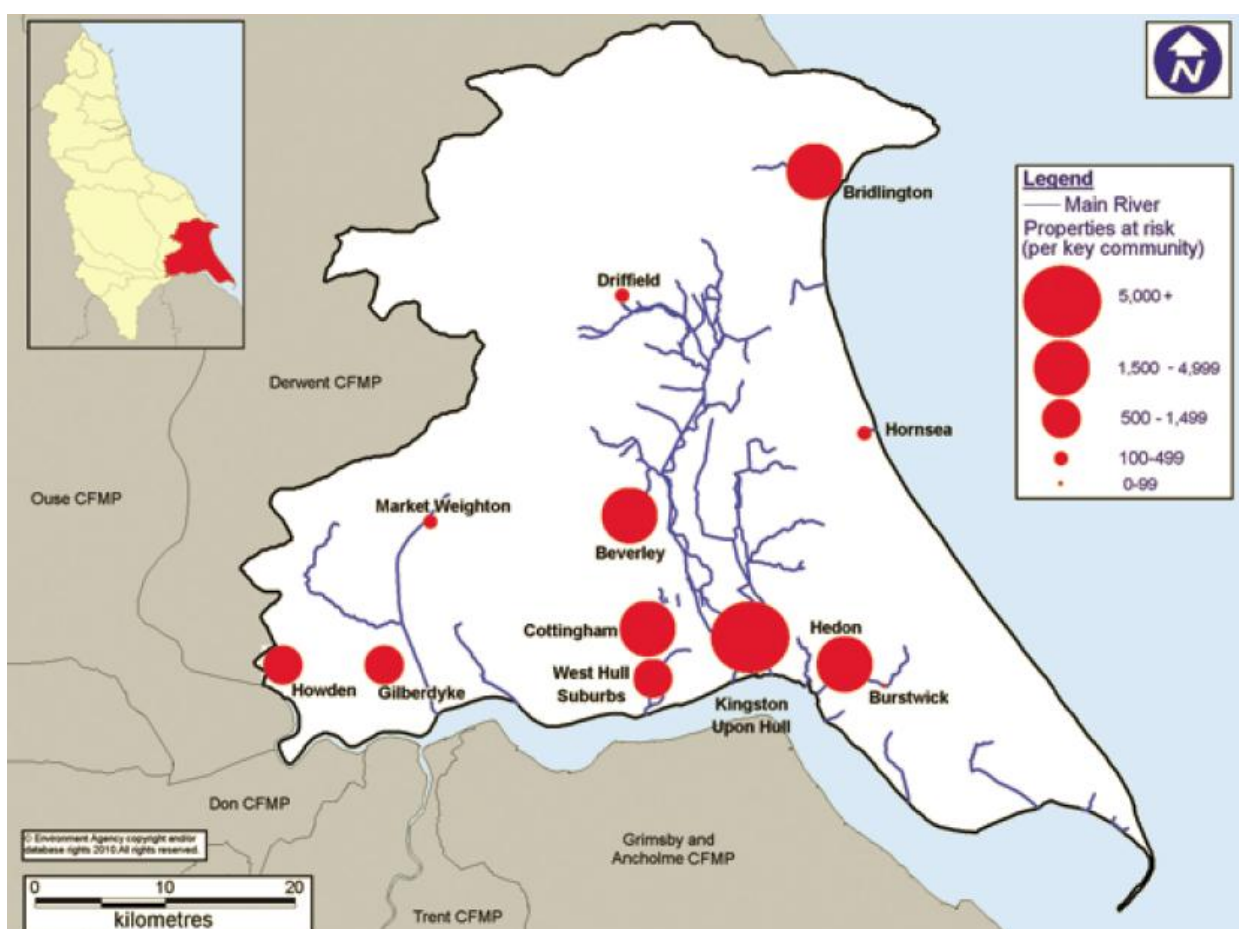


Figure 3.2: Properties at risk of flooding within the River Hull and coastal streams catchment

Source: Environment Agency, 2010b. Where classification of risk is defined by numbers of properties at risk of flooding from a 1% annual probability flood, excluding presence of flood defences

Whilst flood risk management for tidal and fluvial flooding has a long legacy in Hull, the significant threat posed by surface water flooding was highlighted by the Summer floods in 2007, with 8,600 homes and 13,000 businesses flooded (Coulthard *et al.*, 2007). To mitigate surface water flood risk several Flood Alleviation Schemes (FAS) have been designed and are at various stages of consultation and construction. The largest of these is the Willerby and Derringham Flood Alleviation Scheme (WaDFAS), which is situated within the Hull and Haltemprice drainage catchment. This scheme has received funding from multiple sources, including a commitment within the National Investment Plan

(Defra, 2014b) (see table 3.2). Drainage networks connect open watercourses to newly excavated ‘lagoons’ in four different sites and, when completed, will reduce the risk of flooding to 8,085 properties.

Given the legacy of flood defence and land drainage, this research examined these recent efforts to integrate surface water mitigation. We examined the factors driving this shift, alongside the opportunities and barriers encountered in broadening FRM measures within the strategy for *mitigation*. Related to this, we explored the role of *partnership working* and the supporting or constraining factors that influence the effectiveness of this approach. The research questions guiding this analysis are listed in box 3.1.

Box 3.1: Research Questions (RQ) to address in Hull, England

i.	To what extent have <i>mitigation</i> measures been embraced within a defence-reliant regime? How is mitigation situated alongside the strategy for defence?
ii.	What are the opportunities and challenges encountered in broadening mitigation measures?
iii.	To what extent is there evidence for effective partnership working in Hull? What are the barriers to partnership working?
iv.	How have arrangements for flood risk governance evolved over time? What are the driving forces for stability and/or change? In what ways did the 2007 Summer flood contribute to changes in flood risk governance in Hull?
v.	To what extent does the governance arrangement for FRM support societal resilience to flooding?
vi.	To what extent can flood risk governance be described as efficient?
vii.	To what extent can flood risk governance be described as legitimate?

3.3 Analysis of flood risk governance in Hull

3.3.1 Opportunities and challenges to broadening mitigation measures and aligning flood mitigation with defence

This section addresses RQi-ii (Box 3.1). In this case study, both Hull City Council (HCC) and East Riding of Yorkshire Council (ERYC) act as Lead Local Flood Authorities (LLFAs) within their administrative boundaries. However, given the physical setting and interaction between drainage catchments, a close partnership has formed between these authorities. Following the 2007 Summer floods, an independent review commissioned by Hull City Council criticised the lack of coordination and cooperation between the agencies and authorities responsible for different assets, which meant that no one single agency adopted responsibility for flood incident management (Coulthard *et al.*, 2007). Since this time, *partnership working* has strengthened as a discourse, both locally and nationally, and is apparent in Hull in the development of FASs. In terms of the allocation of resources, considerable money, human resources and time have been invested in these FASs, thus this form of mitigation is clearly growing in importance in this case study.

As outlined in table 3.2, the Willerby and Derringham Flood Alleviation Scheme (WaDFAS) has been funded through a range of different sources. Interestingly, this has included support from the European Regional Development Fund (ERDF), which is awarded for projects that promote local economic growth. This is an important local priority given the high levels of deprivation, with Hull Local Authority ranked 15 within the national Index of Multiple Deprivation.⁴⁸ Furthermore, this

⁴⁸ The Index of Multiple Deprivation ranks Local Authorities from 1 to 326; where 1 indicates the highest level of deprivation (DCLG, 2010).

demonstrates how goals of economic development and flood mitigation can be achieved hand-in-hand and provides additional funding opportunities for FRM.

Table 3.2: Funding sources for the Willerby and Derringham Flood Alleviation Scheme (WaDFAS)

Source	Amount (£m)	Amount (€m)
Environment Agency Grant-in-Aid (GiA) (allocated 2015/16)	2.63	3.55
Environment Agency Grant-in-Aid (GiA) (indicative from 2021)	4.06	5.48
Local Levy	0.04	0.05
Public (including IDB precept)	6.63	8.95
European Regional Development Fund	6.60*	8.91
Estimated Total Project Cost	17.68	23.87
Economic benefits (Net Present Value)	525.45	709.36

*Based on figures reported by the Environment Agency in the Flood and Coastal Erosion Risk Management Programmes of Work for the financial year 2015 to 2016 (Environment Agency, 2014d). *Figure obtained from Hull City Council (2014b). Conversion to Euros based on exchange rate of 1.35.*

Another challenge to overcome in developing these FASs was gaining the support of local communities. Given the lack of space in Hull city centre, the WaDFAS is being constructed in the surrounding rural area, raising some concerns amongst the rural community. These concerns were less apparent in instances where the community could see the benefits for the immediate local area (*i.e.* reduced likelihood of flooding), but more pronounced where proposals seemed to sacrifice rural land only for the benefit of urban communities. From speaking with key actors, it soon became clear that this seeming conflict is not only related to FRM, but reflects a broader resistance to urban expansion. To address this, a range of participatory activities have been successful at enhancing public acceptance including; the use of a ‘flood bus’, parish meetings and public exhibitions to demonstrate flood modelling and facilitate a dialogue between the public and relevant RMAs.

A key challenge to *mitigation* is in the case where rights to land need to be acquired and more thorough negotiation processes are necessary. In this case, a Compulsory Purchase Order (CPO) was required to purchase the land (based on current market value), giving ERYC full ownership, as opposed to easement processes employed elsewhere. This decision was taken due to the large-scale of the storage area, the need to maintain the underlying membranes and necessity to have full control. However, an agreement was also made to lease the land back to the former land owner to help maintain its condition. This is the first time that CPO powers have been exercised under the Land Drainage Act 1991 (Section 62) in England. The production of the CPO revealed a lack of statutory guidance, thus the legal team involved adopted a similar procedure to that used under the 1980 Highways Act.

Aside from these FASs, other forms of mitigation were also examined. There is a clear interest in developing options for Sustainable Urban Drainage (SUDS), the importance of which is acknowledged in HCC’s *Surface water management plan* (HCC, 2009) and *Flood mitigation investment plan* (HCC, 2014c). However, there were mixed views amongst interviewees about the value of SUDS in this setting. Where some perceive these measures to be essential for delivering sustainable FRM, others appear to regard these options as somewhat subordinate to other FRMMs (namely defence measures) or even inappropriate in the context of this case study. There was evidence of individuals acting as ‘SUDS champions’ in HCC and Yorkshire Water (YW), with small-scale projects currently at the scoping stage. At this stage, there are no plans for these projects to be scaled-up and rolled-out

as part of a larger effort to retrofit the urban centre. In part, it was evident during the interview process that the delays in implementing SUDS Approving Bodies (SABs) and national standards for SUDS, seemed to create a sense of limbo at the local scale and discouraged HCC and ERYC from developing such measures. This finding suggests that efforts to embrace SUDS require a degree of national steering.⁴⁹ Another constraint discussed by HCC, was the level of investment that Yorkshire Water can commit. Although Yorkshire Water were commended for the significant amount of investment in the city's infrastructure since the 2007 floods, and are open-minded to SUDS, this needs to be achieved in a way that does not increase the customer bills (HCC, 2014c). In addition, there was an impression amongst both LAs that the public do not want to 'see water' and would rather it was hidden in sub-surface drainage networks. This finding highlights a potential opportunity for community engagement activities to facilitate understanding and community 'buy in' to the concept of SUDS.

The extent to which property-level resistance and resilience measures have been encouraged was also explored in this research. Interviewees within ERYC and the EA reported that these measures tend to be very resource-intensive and therefore less efficient than the current large-scale projects under development. Simultaneously, such measures lack guarantees of success (*e.g.* flood gates are dependent on the timely response of the household). These findings suggest that it is not the perceived efficacy of these measures *per se* that is problematic, but the perceived capabilities and willingness of the local community to embrace these types of measures. These are important barriers to overcome if such measures are to be advocated in the future.

Although SUDS retrofitting and property-level measures are not fully supported in this case study, there are efforts to mitigate exposure to risk by enforcing designated floor heights according to the location of the property on the floodplain and Flood Risk Standing Advice (FRSA) provided by the EA (HCC, 2007). In addition, HCC is exploring options for multi-functional land uses, with proposals to develop small-scale flood storage areas at recreational sites (such as parks and football fields).

There is no doubt that Hull reflects a defence-reliant regime; a view shared by flood risk professionals. Therefore, efforts to integrate mitigation measures must be understood within this context. Following the storm surge in Winter 2013, investment has been made to strengthen defences, including a new flood wall at Albert dock as well as 600m of raised defences within the Port of Hull. Funding has been secured via the Local Enterprise Partnership⁵⁰ (LEP) to support the maintenance and development of flood defences. To date, the Humber LEP has made financial contributions towards the Albert Dock flood defences (£3m), Hull and Holderness flood protect (£3m) and FAS at Cottingham, Orchard Park, Anlaby, East Ella and River Hull (£28.3m).⁵¹ This money

⁴⁹ Since this fieldwork was conducted provisions for SUDS have been integrated within spatial planning arrangements. Documents in the public domain indicate that Hull City Council is generally in favour of this approach, providing that appropriate funding is allocated and the issue of maintenance is clarified (HCC, 2014d).

⁵⁰ Thirty-nine Local Enterprise Partnerships (LEPs) exist in England to encourage economic growth in the private sector. This followed the Local Growth White Paper in 2010. LEPs were invited to apply for an Enterprise Zone, of which 24 have been awarded since their introduction in 2010; these boundaries were determined on the basis of natural economic areas.

⁵¹ <http://www.humberlep.org/strategies/strategic-economic-plan/humber-growth-deal/growth-deal-flood-and-coastal-risk-management>

is sourced via the Local Growth Fund⁵². According to an Executive Director within the LEP this was motivated by the importance of supporting economic development and redevelopment in the city. Again, this example highlights the mutually-beneficial value of marrying policy domains.

It is clear that Partnership Funding is supporting the construction of both defence and mitigation measures in this case study. However, interviews with key actors also revealed some challenges of *Partnership Funding* and the allocation of Grant-in-Aid (GiA) according to Cost Benefit Analysis. Firstly, it requires the council to approach possible funders *before* national funding has been secured, meaning that new partners are somewhat requested to commit to a certain amount in advance. Secondly, the type of possible partners also needs to be considered. As discussed by ERYC, rural areas are disadvantaged by a lack of funding partners and lower value attached to the preservation of agricultural land. Connected to the CBA method, properties can only be counted once and assigned to a single flood alleviation project. This is particularly problematic in the Hull and Haltemprice catchment where the same property can be exposed to multiple types of flooding (fluvial, tidal and surface water).

In an attempt to overcome this, the *River Hull Integrated Catchment Strategy* (River Hull Advisory Board, 2014) has tested multiple solutions to determine a preferred approach. Although the Regional Flood and Coastal Committee is meant to approve projects based on the strategic needs of the catchment, there is a perception amongst certain interviewees that projects have often been approved in the past on a first-come-first-serve basis. Consequently, this strategy is perceived as an important step-forward in terms of facilitating joint-prioritisation of investment and a sequenced approach to defence and mitigation works. The preferred strategy includes a range of measures, such as water injection dredging the River Hull, upgrading pumping facilities, embankments and a new barrage in the mouth of the river in the long term (River Hull Advisory Group, 2014). If fully implemented, this package of measures will maximise benefits and cost effectiveness of flood defence in the River Hull catchment.

3.3.2 Opportunities and barriers to partnership working

This section addresses RQiii and focuses on the importance of *partnership working* in FRM. There is considerable evidence for effective partnerships in Hull, especially between HCC and ERYC. This is motivated by several factors. Firstly, the physical setting and drainage characteristics of the area make Hull highly susceptible to flooding, with water crossing ERYC boundaries into HCC. The lack of space within the urban centre also means that large-scale flood storage areas have to be constructed in the surrounding area. In turn, ERYC explained how the calculated benefits for the city of Hull (*i.e.* due to the high number of people and property) are needed to ‘*get schemes built for East Riding*’. In this sense, there is a clear ‘*symbiotic relationship*’ between the two LLFAs. Finally, there is an opinion that the effective and efficient use of resources requires joined-up working and lateral thinking.

Fundamentally, governance could be argued to be an exercise in social relations, which not only requires a good ‘fit’ between different personalities but also requires skills in leadership. These

⁵² The Local Growth Fund was created in 2013. This constitutes an annual fund (to the sum of £2bn) to which LEPs can bid for money to support the economic growth agenda in England. A growth deal is agreed between central Government and the Local Enterprise Partnership (LEP), allowing the LEP a share of the Local Growth Fund to address local growth priorities.

personal attributes are another dimension of resources that is highly relevant to successful governance. In Hull, this was widely discussed by those interviewed. To facilitate interaction and multi-agency working, a number of actor working groups exist, such as the Integrated Strategic Drainage Partnership (ISDP) and the Local Resilience Forum (LRF). These partnerships and forums help to bridge multiple agencies. At the project scale, ERYC discussed the importance of establishing a sound governance framework; namely the Projects IN Controlled Environments (PRINCE2) framework, which is a process-based method of project management used by the public sector in England. This was highly rated for facilitating multi-actor working and helping the project to progress relatively quickly. At a catchment scale, the River Hull Advisory Board (RHAB) represents a partnership between ERYC, HCC, Yorkshire Water, the EA and Beverly and Holderness Internal Drainage Board. This group has developed the *River Hull integrated catchment strategy*, which puts forward a preferred approach for directing investment in the River Hull catchment over the next 20 years (RHAB, 2014)

On a less formal level, HCC and ERYC make conscious efforts to integrate FRM with spatial planning activities, cultivating social relationships and even through to seating arrangements in the office; thus increasing (informal) horizontal governance (Green, 2014). For instance, within HCC, the FRM team are positioned within a wider development delivery team, alongside spatial planners and conservation officers (City Planning Manager, HCC). In part, joined-up working is supported by the administrative structure of the council; as unitary authorities, FRM and spatial planning departments within HCC and ERYC are closely aligned, even located within the same office. In contrast, for two tiered authorities where LLFAs and the LPA operate at the country and district level, respectively, this may be more difficult to achieve.

However, despite these efforts our research indicates that relationships between Yorkshire Water and other RMAs are sometimes strained. Fundamentally, this seems to be related to the different modes of governance through which these actors operate and a conflict of interests. Yorkshire Water as a quasi-commercial actor is driven by commercial interests and the satisfaction of customers and shareholders. As observed by interviewees, and commented by others (CIWEM, 2013), this can make water companies more risk adverse and more likely to continue investment in drainage infrastructure. Indeed, a representative from Yorkshire Water interviewed as part of this study, also remarked on the tensions that can arise between the regulatory functions of the company and the goals of FRM. Whilst this interviewee was a strong advocate of SUDS as the “*right thing to do*”, this opinion is being voiced within an institutional culture driven by business principles. Furthermore, there are only three employees responsible for FRM activities within Yorkshire Water’s district. In the opinion of this study, more personnel and resources should be made available to support the company’s risk management functions.

3.4 Explaining change and stability in flood risk governance in Hull

The physical setting of Hull has been a key factor in shaping the approach towards land drainage and hard-engineered defences, without which development in this area would not have been possible. This has instilled a reliance on the strategy of *Defence*, creating ‘sunk-costs’ and a degree of path dependency in the approach to FRM. Inadvertently this has also heightened the risk of flooding by enabling people and businesses to locate in an area highly susceptible to flooding (‘escalator effect’, Parker, 1995); thus increasing the damage potential when flood events occur. In turn, this has

created a strong ground for continued investment in defence and mitigation projects. In terms of flood risk governance, the natural interaction between drainage catchments inherently required the neighbouring LLFAs to work together, long before the discourse for *partnership working* was formalised in England.

There is also evidence for so-called **catalyst flood events** impacting FRM and governance at the local scale. In Hull, events such as the east coast floods in 1953 and the floods in 1969 highlighted the importance of a Storm Tides Warning Service (the predecessor to the Coastal Monitoring and Forecasting Service today) and strengthened the sub-FRGA for flood forecasting and warning at the national scale. These events also highlighted the need for effective defence infrastructure; leading to the completion of the Hull tidal surge barrier 1980. In terms of driving changes in governance, the Summer floods in 2007 and subsequent reviews locally (Coulthard *et al.*, 2007) and nationally (Pitt, 2008), gave weight to the discourse of surface water flooding and helped to inform development of the Flood and Water Management Act 2010. This is an example where events at the local scale have prompted governance shifts at the national level. At the local scale, these floods were also described by interviewees as a pivotal event and '*positive turnaround*' (City Planning Manager, HCC), that prompted closer interaction between HCC and ERYC; '*it became quite evident that we needed to build up the resource within the authority ... we were already ahead of the game, ahead of the FWMA*' (Flood risk strategy manager, ERYC). Both LLFAs remarked on the high level of resources compared to other areas, including staff, funding and political support from council members. With HCC, there was also a commitment to essential ring-fencing part of the Local Services Support Grant for FRM activities. The Summer floods also prompted the creation of the Integrated Strategic Drainage Partnership (ISDP), a technical working group comprised of representatives from HCC, ERYC, EA and Yorkshire Water. This group supported the development of Hull's *Surface water management plan* and subsequent *Flood mitigation investment plan* (HCC, 2011).

From our case study research, the important role played by different actor groups was emphasised. **Policy champions** exist within HCC who advocate the use of SUDS and the importance of retrofitting certain areas of the city. Such efforts were also apparent within Yorkshire Water, although this is challenged by the mode of corporate governance. Such individuals have the potential to change FRM practice, rather than governance *per se*.

Broader **discursive shifts** evident at the national scale are also echoed at the local scale and identified as driving factors for holistic approaches to FRM (*e.g.* sustainability FRM and Natural Flood Management). However, there is evidence that so-called 'good practice' is exercised before being formalised at the national scale. For instance, 'partnership working' was already in operation in Hull prior to formal rule changes. There is however perceived pressure from the national-level discourse concerning Natural Flood Management and the need to better address environmental concerns. Those interviewed within ERYC expressed a tension between '*...what was designed as an engineering system to get water in, i.e. an artificial system, [and the] pressure to sort of turn it into a natural system. It's difficult to balance those two*' (senior flood risk strategy and policy officer, ERYC). Nonetheless, the development of several large-scale FASs suggests that this tension is being resolved.

An important exogenous factor prompting changes in flood risk governance in Hull is shifts in national **political ideology**. An important turning point was privatisation in the 1980s (Section 2.4), which led to the formation of quasi-commercial water companies (albeit highly regulated via Ofwat⁵³). With this, responsibilities for certain assets became highly fragmented and complex. Others have highlighted the detrimental impact of privatisation upon national flood risk governance (Green, 2014) and in Hull specifically (Coulthard *et al.*, 2007; Coulthard and Frostick, 2010). Interviewees also reflected on the resulting loss of drainage expertise within local authorities. More recent legislative changes have sought to address this fragmentation. For example, it is now mandatory for utility companies to provide information and cooperate with RMAs (namely the Civil Contingencies Act 2004, Climate Change Act 2008 and the FWMA 2010). However, the analysis presented thus far has demonstrated the need for further mechanisms to bridge the gap between FRM and corporate governance model adopted in the water industry.

Technological advancement has also helped shaped shifts in FRM. Locally modelled data has developed through ERYC-commissioned modelling by *Clear Environmental Consultants* (focused on the Hull and Haltemprice catchment, only) as well as Yorkshire Water who developed a city wide model for their pumped sewerage infrastructure. This led to the development of an integrated 1D-2D model to better capture the interaction between the surface water drainage network and subsurface sewer network. These modelling outputs provided important inputs into the design and business case for the flood alleviation schemes (Waudby, 2012). Importantly, this modelling facilitated public consultation and understanding of flood dynamics, even challenging the expertise of drainage experts; “*it made us really think outside the box*” (flood risk strategy manager, ERYC). More recently, a fully integrated catchment model for the River Hull has helped inform a preferred approach for FRM to steer investment priorities and support a joined-up approach between RMAs (River Hull Advisory Board, 2014). Thus, flood modelling is also having a crucial role in shaping the interactions between actors and the allocation of resources, thereby exerting a greater influence of flood risk governance.

3.5 Evaluating flood risk governance in Hull

Flood risk governance in Hull was evaluated according to the extent to which it facilitates societal resilience (in terms of the *capacity to resist flooding; absorb and recover and adapt*) and whether it does so in an efficient and legitimate way (addressing RQ v-vii in Box 3.1). Further details are provided in Alexander *et al.* (2015a). This section reports the key findings only and complements the national-scale evaluation; unless stated otherwise, the features of governance reported in Section 2.5 are equally applicable here.

3.5.1 To what extent does flood risk governance enhance societal resilience to flooding in Hull?

- I. The capacity to resist flooding is supported through established defence and land drainage infrastructure, as well as considerable investment in Flood Alleviation Schemes to mitigate surface water flood risk. Indeed, the investigation into the tidal flooding reported that 19,000

⁵³ Ofwat (The Water Services Regulation Authority) is the economic regulator for the water industry in England and Wales, since privatisation in 1989.

properties were successfully defended by EA defences (HCC, 2014a). However, 264 properties and businesses were affected by flooding (Wragg, 2014; HCC, 2014a). Since this time, investment has been made to strengthen defences in this area of the city, including a new flood wall at Albert dock as well as 600m of raised defences within the Port of Hull. When completed (ca. June 2015) it is anticipated that these defences will protect up to 300 homes and businesses.⁵⁴

- II. A recurring theme in many interviews was the issue of degrading flood defences and the lack of available funds to support defence maintenance. On this front, those interviewed from ERYC, HCC and the EA stressed that this is considerably under-resourced, both locally and nationally. There is a noticeable degree of frustration towards the perceived attitude nationally to fund new defences, whilst cutting budgets to maintain existing lines of defence. Several stakeholders expressed their concerns about the impact that this could have in terms of undermining the capacity to resist flooding in the future.
- III. The development of Flood Alleviation Schemes following the detrimental impacts of the 2007 Summer floods, demonstrates institutional learning, innovation and efforts to improve FRM; important indicators of adaptive capacity.
- IV. A new flood warning service was implemented in November 2014, utilising new modelling data to enhance the accuracy of flood forecasting and communicating warnings via text, email, phone or fax. This service covers Hull East, Hull West and Hull City Centre, targeting 100,000 properties.⁵⁵ The effectiveness of this is yet to be tested, but in theory this should strengthen capacity to proactively respond to an imminent flood event and reduce damages if appropriate actions are taken.
- V. A barrier to societal resilience is the lack of public interest in flood risk and general apathy. According to those interviewed, this can be attributed to the view that the Summer floods in 2007 was a 'once in a lifetime event' and therefore the likelihood of a recurring flood of that magnitude is perceived as small. Aside from risk awareness, some interviewees explained that formal responsibilities for FRM are poorly understood by members of the public. This can create tensions (particularly post-flooding) and expectations that the state should defend against flooding. Some interviewees also expressed the view that this reflects the legacy of engineering practices in Hull and assumption amongst the public that these will continue to be successful in the future. In this sense, it seems that FRM measures can create path dependencies in societal expectations.

3.5.2 To what extent can flood risk governance in Hull be described as efficient?

- VI. The River Hull Integrated Catchment Strategy (when approved) will provide a means of prioritising defence and mitigation projects on a catchment basis. This will ensure that a

⁵⁴ For further details see <https://www.gov.uk/government/news/albert-dock-flood-defence-improvement-work-to-start>

⁵⁵ For further information on new flood warning service in Hull visit <https://www.gov.uk/government/news/new-flood-warning-system-launched-in-hull>

strategic approach is taken to target resources and encourage ‘packaged’ approaches to defence/mitigation measures (River Hull Advisory Board, 2014).

- VII. Efforts to develop multi-functional land use (as discussed by HCC and ERYC), could help combine resources from different departments within the Local Authority and ensure desirable input to output ratios.
- VIII. Those involved in the ERDF bidding process commented on the arduous nature of the administrative process and perceived excessiveness of regulation (colloquially referred to in England as ‘*red tape*’). The process required a significant amount of resources in terms of time and staff, and had the application not been successful, this would have been regarded as a ‘waste’ of these resources. The overall duration of the process took just over two years to complete. This bureaucracy is understandable given the considerable sum of money sought, but this finding does imply some potential for streamlining bidding processes.
- IX. Finally, the perceived ratio of input to outputs involved in encouraging property-level measures is seen by RMAs to be inefficient and appears to undermine willingness to pursue these measures; in turn, this could have implications for resilience at the household scale.

3.5.3 To what extent can flood risk governance in Hull be described as legitimate?

- X. A range of public consultation and participation methods were employed. For example, public exhibitions of flood modelling and displays of the flood storage areas in the WaDFAS have facilitated awareness and public acceptance (Waudby, 2012).
- XI. Negotiation processes were employed where sites needed to be acquired for the WaDFAS. In one case this led to the use of a Compulsory Purchase Order (CPO), whereby the land was purchased by ERYC and is now leased back to the original land owner. Arguably, the potential threat of a CPO limits the extent to which true negotiation is achieved; given that power ultimately remains with the local authority. However, this is a legally sanctioned process (under the Land Drainage Act 1991) and was viewed by the authorities involved as essential given the large scale of the work involved.
- XII. An important criterion of legitimacy is *procedural justice* and the opportunity to challenge decision-making. An interesting example is that ERYC threatened the EA with Judicial Review on the grounds that the EA draft strategy for the River Hull produced in 2008 did not comply with consultation guidelines. This challenge was settled out of court.
- XIII. Following the significant floods in 2007 and the Winter floods in 2013, reviews were carried out to identify the causes of flooding (Coulthard et al., 2007; HCC, 2014a). Crucially, such scrutiny enhances transparency and accountability in flood risk governance, as well as providing an opportunity to evaluate the current arrangement and identify lessons to learn, which is necessary for adaptation.

3.6 Conclusions

Returning to the research questions, the following conclusions can be drawn from this case study:

- There have been considerable efforts to broaden the strategy for flood mitigation, particularly through the (eventual) construction of several FASs. This is situated alongside flood defence, which, given the physical characteristics of area, will continue to remain important. To enhance the capacity to resist flooding and improve efficiency, the *River Hull Integrated Catchment Strategy* (when approved) will facilitate a strategic and integrated approach between RMAs, enabling the delivery of packaged defence measures. This is highlighted as an example of good practice.
- A number of factors have contributed to the development of mitigation measures. The Willerby and Derringham Flood Alleviation Scheme (WaDFAS) has been enabled through Partnership Funding and a close partnership between HCC and ERYC. Public engagement activities have also helped gain the publics' acceptance of the scheme. Other mitigation measures are somewhat constrained in this case study. Delays in the implementation of the FWMA 2010 in relation to the provisions for SUDS created a sense of limbo and stalled action at the local scale. Local champions within HCC and the Water Company are promoting the use of SUDS for localised 'flood hot spots', but there is no strategy for retro-fitting the wider urban area. In addition, property-level measures are perceived as less effective and cost-beneficial in this area.
- This case study is a good example where FRM has been successfully aligned to the goal of economic development and regeneration within an area of high deprivation. This has provided access to additional sources of funding; namely the European Regional Development Fund and the Local Enterprise Partnership.
- Successful partnership working is steered by shared goals, mutual benefits, personal qualities and trust between the actors involved. However, there are clear differences in the priorities and mode of governance within the Water Company compared to other Risk Management Authorities. This means there are constraints on what the Water Company is willing and able to invest in (according to its regulatory functions and rules).

4 Exploring the implementation of a multi-scale flood risk management scheme within the context of Partnership Funding – A case study of flood risk governance in the Lower Thames and the River Thames Scheme

4.1 Introduction and scope of the analysis

This chapter summarises the main findings from empirical research conducted within the Lower Thames. Key socio-demographic and physical characteristics of the city are summarised in table 4.1. This research examined the decision-making processes surrounding the River Thames Scheme (RTS); a project involving a mix of FRM measures, applied at different spatial scales (e.g. alleviation channels and property-level measures). In particular, this study examined the influence of funding rules and discursive shifts in FRM upon the design of the scheme since its original proposal in the 1980s, as well as the impact upon governance at the project scale. The study has been carried out using in-depth policy and legal analysis, and accompanied by semi-structured interviews with key actors involved in flood risk management (Table A1, Annex).

Table 4.1: Key characteristics of the Lower Thames case study

Key facts and figures	
Region and county	Greater London, South East England
Population	Ca. 800,000 in area of study
Population density (people / ha)	27.7 (average of towns located by the River Thames)
Elevation	Approx. 10-21 m
River basin	River Thames 77approx. 12,935 km ²
Properties at risk from a 1% flood (excluding presence of flood defences)	c. 15,000 properties
Types of flooding	Fluvial, surface water and groundwater
Index of Multi Deprivation (where 1 represents the highest level of deprivation, out of a possible 326 local authority areas)	252-322

4.2 Contextual background of the case study

This research is focused on a 40km stretch of the River Thames from Datchet to Teddington, situated west of the City of London and referred to as the Lower Thames (figure 4.1; Environment Agency, 2010c). This part of the river is subject to fluvial processes, as opposed to the tidal stretch of the River Thames which runs downstream from Teddington. The Lower Thames catchment is susceptible to fluvial and surface water flooding, as well as rising groundwater (Environment Agency, 2009b). With over 15,000 properties located within the 1 in 100 year flood boundary, this represents one of the largest areas of developed floodplain in England. Significant flood events have occurred in 1947, 1968, 2003 and in January 2014. However, there are currently no formal flood defences on this stretch of this river. Although there are weirs that have a secondary role in flood alleviation, these structures primarily maintain navigation depths on the river (Environment Agency, 2010c). In addition, fluvial flood risk is sometimes managed in the Teddington area through the operation of the Thames Barrier (although its primary function is to manage the risk of tidal flooding in the City of London).



Figure 4.1: Location of Local Authorities involved in Lower Thames Scheme. Surrey County Council includes, among other districts, Runnymede Spelthorne and Elmbridge

Source: MarCom-Carto – Faculty of Geosciences –Utrecht University

The River Thames Scheme was provisionally approved in 2011, although early conceptions of the scheme began in the 1980s. Upon completion the RTS will benefit 15,000 properties, as well as local infrastructure (e.g. roads, sewerage network) and businesses (Environment Agency 2010c; 2014c). The alleviation channels will protect 9,500 properties to a 1 in 75 year standard of protection (Environment Agency, 2014c). This scheme adopts a partnership approach between the EA, Defra, Thames Water and seven Local Authorities (Box 4.1) and will be delivered in two phases by 2025 (table 4.2).

Box 4.1: Local Authorities involved in the delivery of the River Thames Scheme

- Royal Borough of Kingston upon Thames (LLFA)
- London Borough of Richmond upon Thames (LLFA)
- Elmbridge Borough Council
- Runnymede Borough Council
- Spelthorne Borough Council
- Surrey County Council (LLFA) (Elmbridge, Runnymede and Spelthorne Borough Councils belong to Surrey County Council)
- Royal Borough of Windsor and Maidenhead (LLFA)

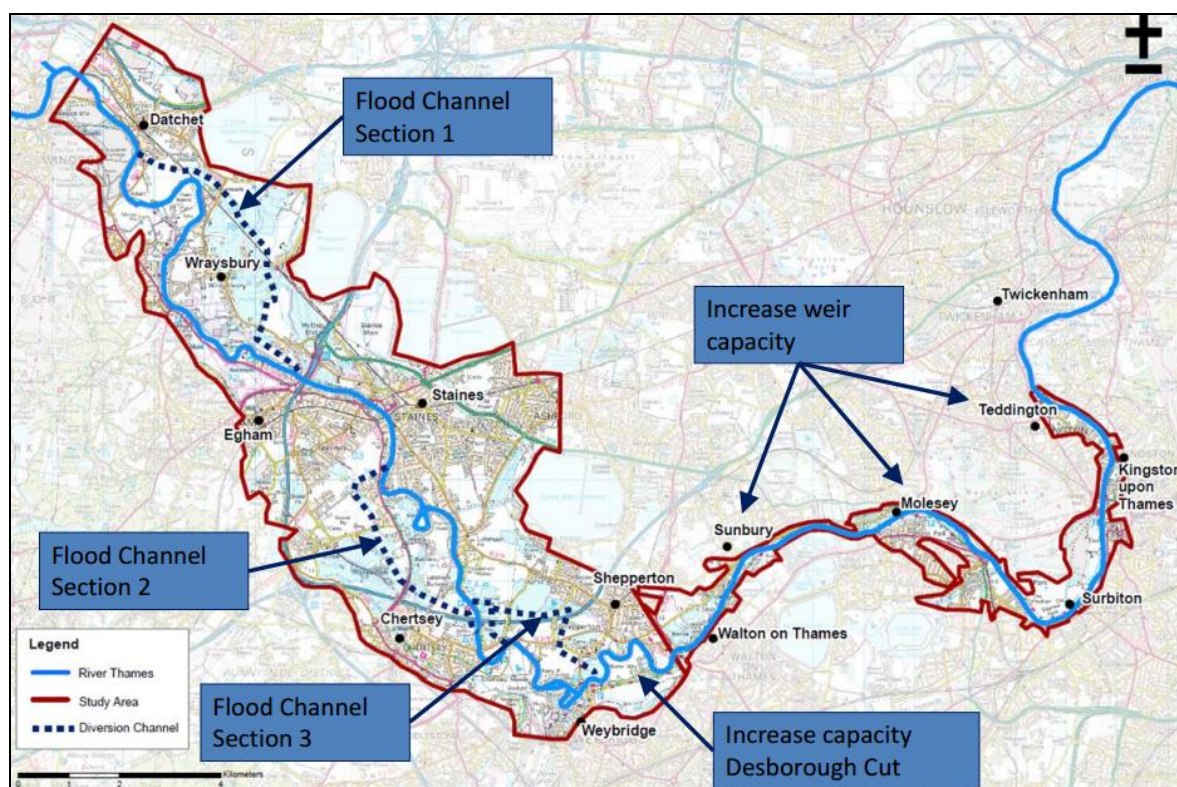


Figure 4.2: The River Thames Scheme – Location of the channels and weirs.

Source: Environment Agency (2014c)

Upstream from Datchet, the River Thames is regulated by a flood alleviation channel, the *Jubilee River* (JR), which diverts from the River Thames near Maidenhead and re-joins the main river just upstream from Datchet. This scheme was completed in 2002 and provides flood protection to 3000 properties (Environment Agency, 2014c). The JR is important in the context of this case study. Firstly, the JR is perceived to have exacerbated flooding by certain members of the downstream community, even though two independent studies have proved this is not the case (JMP Consultants Ltd. 2003; FRAG 2003). Secondly, the JR evolved through extensive consultation with multiple stakeholders and was a leading example of this at the time (Warner, 2011). Since this time, consultation and public engagement has become highly institutionalised within national flood risk governance (Section 2.5.3). Given the complex arrangement of actors involved in the RTS, this study examined the opportunities and challenges encountered through this process. This research sought to unpick the decision-making processes and influence of funding rules and discursive shifts in FRM upon the design of the RTS since its original proposal in the 1980s (Box 4.2).

Box 4.2: Research Questions (RQ) to address in the Lower Thames case study

- i. What has been the impact of funding rules and discursive shifts in national flood risk governance upon the design of the RTS?
- ii. What factors support or constrain the delivery of the RTS?
- iii. How have arrangements for flood risk governance evolved over time in the River Thames? What are the driving forces for stability and/or change?
- iv. To what extent does the governance arrangement for FRM support societal resilience to flooding?
- v. To what extent can flood risk governance be described as legitimate?
- vi. To what extent can flood risk governance be described as efficient?

4.3 Analysis of flood risk governance in the Lower Thames

4.3.1 The impact of funding rules on the design of the River Thames Scheme

The River Thames Scheme was originally conceptualised in the 1980s, but was only granted approval in 2011. Under former funding rules, it was exceptionally difficult for the RTS to achieve a favourable cost-benefit ratio, largely due to the physical characteristics of the catchment. Although a significant amount of properties are located on the floodplain, the area is extremely flat and the river does not overflow until a 12 year return period; however, it is difficult to justify any major expenditure without the 1 in 5 or 1 in 10 year events (senior academic expert). Significant efforts were made to improve the cost-benefit ratio and consider alternative measures to alleviate the likelihood and consequences of future flooding (e.g. Lower Thames Strategy Study; Halcrow Group Ltd & Babbie Brown and Root, 2004; Johnson *et al.*, 2007). These efforts were supported by technological advances in flood modelling and the inclusion of climate change factors. This had a clear impact on the design of the RTS and the decision to diversify the type and scale at which measures are implemented. As illustrated in table 4.2, the original plan to construct flood alleviation channels was complemented with property-level protection measures as well as broader plans to enhance emergency preparedness and response.

Table 4.2: Measures involved in the River Thames Scheme

Phase 1	Phase 2
<ul style="list-style-type: none"> ▪ Developing a funding strategy ▪ Hydrology and modelling study ▪ Ecological assessments ▪ Installation of property level products for up to 1,200 homes ▪ Major incident planning to improve preparedness and response to flooding ▪ Increasing flow capacity of three weirs (to start in 2016) 	<ul style="list-style-type: none"> ▪ Increase the flow capacity of Desborough Cut ▪ Construction of a flood alleviation channel, 17km long and divided into three sub-sections (to start in 2020) ▪ Creation of over 40 hectares of wildlife habitat

There was a strong consensus amongst those interviewed that the introduction of Partnership Funding (Defra, 2011a) has been pivotal in getting the RTS off-the-ground. This policy is of particular interest for this scheme given its magnitude. Although the majority of funding has come from central government, a significant proportion must be sourced at the local scale (table 4.3). At the time of writing, £50m (£67m) must still be secured by local authorities and other partners in order for the scheme to be implemented (Environment Agency, 2014d; HM Treasury, 2014; Surrey County Council, 2015). An interviewee from the EA expressed both positive and negative viewpoints concerning the implementation of Partnership Funding:

‘Before Partnership Funding the RTS would not probably get off the block with the national funding system, [due to the high cost of it]. Partnership Funding opens up the opportunity to reassess the Scheme, and to see whether or not the funding could be met or not ... but it has been one of the reasons why little progress has been made since the approval of the RTS in 2011, as efforts have been put mostly in working towards a funding strategy’ (senior representative, EA).

Table 4.3: Estimated costs, net value and sources of funding for the River Thames Scheme

Source	Amount (£m)	Amount (€m)
FCERM GiA	160.00	216.00
Autumn Statement 2014	60.00	81.00
RFCC Local levy	28.90	39.02
Local Councils (last year)	0.50	0.68
LEPs (confirmed)	2.30	3.12
Total project cost	302.00	407.70
Further required	ca. 48.00	64.8
Local Councils (over next 5 years)	5.00	6.75

Based on figures reported by the Environment Agency in the Flood and Coastal Erosion Risk Management Programmes of Work for the financial year 2015 to 2016 (Environment Agency, 2014d). Conversion to Euros based on exchange rate of 1.35.

The inclusion of an additional £60 million (€81m) from central government was seen as encouraging by local councils (Surrey County Council, 2015). However, even though the proportion to be funded locally is much lower than before, Local Authorities must still meet the £50m shortfall. The ability of LAs to raise their share is one of the most important barriers the RTS is facing at the moment. Whereas some LAs are finding it difficult to find the money, others could not see a direct benefit from the RTS. For instance, in Richmond and Kingston surface water and groundwater flood risk exceeds fluvial flooding. As one interviewee explained, the contribution from each LA is likely to be proportional to the perceived benefits of the RTS within each administrative boundary. For example, councils upstream will benefit greatly from the construction of the channels and those downstream will benefit from the implementation of other measures the Scheme proposes, such as the installation of property level products or the improvement of emergency management and warning systems. The proportion corresponding to each district is an issue which had not been discussed by the Programme Board at the time of writing this report (senior representative, Elmbridge).

Even amongst Local Authorities supporting the RTS and with a clear benefit (*i.e.* Spelthorne, Runnymede and Elmbridge) there is a concern about where the additional funding will come from. Some of these LAs are really small districts with small budgets, so even if their whole budget went to the RTS, it would still be small in comparison to what is required. Local levy is a delicate issue and all the LAs agreed they will not consider the possibility of a tax increase. The main reason for this is that even if a local levy was imposed it would still be insufficient, and might cause political tension for a very little amount of money (senior representatives from Spelthorne and Elmbridge). An increase in taxes can also restrict the possibility to raise funding for other issues, due to the cap on Council Tax (DCLG, 2013b). There was also a perceived issue of social equity and whether it would be fair to apply the tax to all the tax payers, given that not all tax payers are at risk of flooding or direct beneficiaries of the scheme (senior representative, Elmbridge).

To promote investment from other sources, workshops and economic modelling are being employed to help communicate the potential benefits to local businesses, including those not directly impacted by floods, but impacted by cascade effects (*e.g.* traffic disruption). Local Enterprise Partnerships (LEPs) have provided some support via growth funding, with the Enterprise M3 LEP contributing £300,000 (€405,000m) and the Thames Valley & Berkshire LEP contributing £2m (€2.7m). More recently, Heathrow Airport has been identified as a potential contributor as part of its £166bn extension plan. Government Ministers are currently consulting on this, following the Davies

Commission recommendations published in July 2015 (Airports Commission, 2015). As with the Kingston-upon-Hull case study, it seems that aligning FRM with economic growth is a necessary means of funding flood defence and mitigation measures.

4.3.2 The importance of partnership working in the Lower Thames

In relation to RQii it became very evident in this research that partnership working is a key factor supporting the RTS. Stakeholder engagement is not new in this area, having its origins during the 1980s when discussions about the Jubilee River (JR) were taking place. The JR was considered as a pioneer project in the sense of being open and inclusive, involving different stakeholders in the decision making stage. Although the JR can be regarded as *sociably responsible* by engaging citizens (Warner, 2011), this is different to the formalised partnership evident in the RTS, whereby all partners have been involved in the decision-making process since the early design of the scheme.

In practice, it seems that the relationships established in the RTS are progressing in a positive way (senior representative, EA). Partners are working towards a memorandum of understanding to formalise their relationship further, which will be later formalised into a partnership agreement. This is particularly relevant once funding is secured and exchanged, and helps promote a degree of security and trust between funding partners (senior representative, EA). Governance frameworks have been established, including a high-level sponsoring group comprised of Chief Executives and Deputies from all the LAs, and a Programme Board to oversee all projects. There are also project managers and project boards.

Based on the interviews with Local Authorities, it is clear that there is a strong preference for partnership working, from the early design stages of a project onwards. Overall, there was general support for the way the EA is managing the delivery of the scheme, facilitating multi-actor interactions and generating spaces for open discussions.

Although partnership working is clearly successful, a number of constraints and shortcomings were highlighted by interviewees. It was argued that more should be done to engage local communities. On this front, Surrey County Council, Spelthorne and Runnymede Borough Councils have established Local Flood Forums (LFF). These are organizations which act at the community scale to gather information, inform local residents and take action in relation to flood problems. They are usually organised by Parish Councils (where in existence) and include members of the local authority, the Environment Agency, Thames Water, and members of the public, amongst others. Meetings are open for residents to attend. Currently there are 13 LFFs. To increase participation, a sub-project within the RTS is focused on enhancing public involvement in preparation and response activities.

4.4 Explaining change and stability in flood risk governance in the Lower Thames

The **physical characteristics** of the River Thames catchment were influential in the Cost-Benefit Analysis (CBA) underscoring the delivering of different defence schemes. Whilst this gave favourable results for the Maidenhead area and led to the construction of the Jubilee River, the outcome for the RTS was less favourable. Despite further efforts to improve the cost-benefit ratio through advances in flood modelling in the early 1990s, these remained unsuccessful and attempts to determine a

solution were abandoned. However, **technological advances** in flood modelling and climate change scenarios have since played an important role in gaining the approval of the RTS.

Flood events have not have a significant impact on flood risk governance in this case study, *per se*. Arguably the 2003 floods in Datchet prompted the EA to reassess the potential of the RTS. Floods in 2003 and 2014 also reinforced the perception amongst certain members of the public that the Jubilee River was to blame. Whilst this perception has been refuted, this has influenced the interaction between flood risk professionals and the public, and enforced the importance of public engagement as the RTS has progressed.

Broader **discursive shifts** evident at the national level are also mirrored at the local scale and identified as driving factors for holistic approaches to FRM. The diversification of measures in the Lower Thames was first considered in the late 1990s, as an alternative to the expense of constructing large diversion channels. This represented a significant departure from the past (*e.g.* construction of the Jubilee River). Whilst this reflected efforts to achieve a favourable cost-benefit ratio, to a lesser extent this partially echoed a growing recognition at a national level that defence is not possible at all locations, nor the most economic, social or environmentally sustainable approach. The use of community-based alternatives (*i.e.* property-level measures) is also aligned to a broader governance discourse and transfer of responsibilities towards the local scale (Section 6.2.4). Thus discursive shifts at the national scale can be identified as an influential factor in the design of the RTS (RQi). Related to this, increasing emphasis has been placed on the importance of *community engagement*. This is not only a means of unlocking potential contributors for Partnership Funding, but is also attached to improving transparency and democracy within the decision-making process. In the case of the RTS, community engagement has also been an important strategy for enhancing the acceptance of the scheme.

Based on this analysis, a key endogenous factor for change has been the **shift in funding rules**, *i.e.* from a block grant allocation of Grant-in-Aid to Partnership Funding. This was a key turning point in gaining approval for the RTS and the diversity of actors with a financial stake in the scheme. In this sense, the introduction of Partnership Funding has strengthened the importance of collaboration between multiple actors and stakeholders. However, it should be borne in mind that this is also the reason why the scheme has not been implemented at this stage, as further funding is required at the local scale (Section 2.3).

4.5 Evaluating flood risk governance in the Lower Thames

Flood risk governance in the Lower Thames was evaluated according to the extent to which it facilitates societal resilience (in terms of the *capacity to resist flooding; absorb and recover and adapt*) and whether it does so in an efficient and legitimate way. Further details are provided in Micou *et al.* (2015a). This section reports the key findings only and complements the national-scale evaluation; unless stated otherwise, the features of governance reported in Section 2.5 are equally applicable here.

4.5.1 To what extent does the River Thames Scheme support societal resilience to flooding?

- I. The RTS employs a diversity of FRM measures to manage the likelihood and consequences of future flooding. Collectively, these measures (when implemented) will enhance the capacity to resist flooding, absorb and recover should flood events occur. This is supported by the multi-scale approach to the RTS; thus, should flows exceed the capacity of the alleviation channels or river, effective emergency response arrangements will be in place. This is a good illustration of FRM in England more broadly where sole reliance of single measures or strategies is discouraged, and represents a holistic approach to FRM.
- II. Although there is significant potential and a clear need for the RTS, its implementation remains subject to securing further funding. This case study clearly illustrates the challenges that can be encountered in raising money at the local scale, where the level of benefits and ability to raise resources varies between actors. The current shortfall has raised significant concerns about ability to fully implement the RTS (NAO, 2014). This is identified as a current constraint to societal resilience in the Lower Thames area.
- III. Significant efforts have been made to engage local communities and enhance risk awareness. As reported in Section 2.4, sustaining awareness can be a challenge, especially if floods do not occur frequently. As part of the RTS, the EA has recruited community engagement officers to enhance preparedness and capacity to respond at the household and community scale.
- IV. To enhance the capacity to resist flooding and facilitate adaptation at the household scale, property-level measures form part of the RTS. However, when the EA initially proposed these measures to 1,600 properties (free of charge), only 536 (33%) expressed interest. According to a senior representative in the EA, this was attributed to a number of factors. This included i) a lack of awareness of flood risk; ii) those who were aware did not want to admit their risk in case this impacted the cost of insurance; and iii) distrust towards authorities. Once implemented, the success of property-level measures is also dependent on several factors (*e.g.* timely responses from the household and skills in implementing measures). Whilst such measures have considerable potential to enhance societal resilience at the household scale, this can be constrained.

4.5.2 To what extent can the River Thames Scheme be described as efficient?

- V. The diversification of FRM measures included within the RTS has resulted through shifts in funding rules and discursive shifts at the national scale (Section 4.4); however, this also provides the most cost-effective approach and best use of public money (*i.e.* as 75% of the scheme's funding is via the public sector). The scheme has a reported cost benefit ratio of 6.4, which rises to 12.1 when factoring in climate change (Environment Agency, 2014c).
- VI. Besides the alleviation of flood risk, the RTS delivers other environmental and social benefits (*e.g.* enhancing biodiversity and conservation areas). Multiple benefits are also encouraged

at the national scale (Section 2.5) in an attempt to improve ‘value for money’. This demonstrates a concern for resource efficiency.

- VII. Efforts to secure money at the local scale are clearly resource intensive in this case study.

4.5.3 To what extent can the River Thames Scheme be described as legitimate?

- VIII. The RTS is identified as an example of good practice in terms of public consultation and participation. A dialogue has been sustained between actors, stakeholders and interest groups since the initial design stages. For example, workshops have been initiated to facilitate knowledge exchange between these groups. This instils a more democratic approach to decision-making whereby the interests of different groups are fully represented. Interaction has taken place with over 30 community groups and ‘drop in’ sessions are due to take place to allow local residents to discuss the RTS with the Environment Agency. It is envisaged that workshops will be held in due course to discuss the design of the alleviation channels.
- IX. To facilitate public understanding of flood risk science and the benefits of the RTS, 3D visualisation of flood modelling will be made available to the public. This will support the consultation/engagement process described above.
- X. In terms of procedural equity, a public enquiry will also be held before the construction of the alleviation channels to give residents the opportunity to challenge decisions that have been made. However, it is envisaged that the extensive consultation process will mitigate any concerns and give stakeholders an opportunity to challenge decisions before they are made, and not after (senior representative, EA).

4.6 Conclusions

Returning to the research questions, the following conclusions can be drawn from this case study:

- A range of factors have enabled the River Thames Scheme to progress since its original introduction in the late 1980s. The inclusion of a diverse range of measures at different scales, improvements in flood modelling and the integration of climate change factors have enhanced the cost-effectiveness of the scheme and improved the cost-benefit ratio. However, the implementation of *Partnership Funding* from 2012 can be credited as the main enabling factor.
- The application of diverse and multi-scale measures is not only reflective of changes in funding rules, but has also been influenced through discursive shifts in national flood risk governance (*i.e.* holistic and sustainable FRM, environmental discourses and governance discourses).
- Partnership funding has enabled the River Thames Scheme to progress where it has stalled under previous funding rules. However, £50m must be sourced at the local scale before the scheme can be implemented. There are significant challenges with raising this money amongst the affected Local Authorities, especially as distribution of benefits is varied

across these LAs. This raises questions about whether schemes of this nature should be exempt from the Partnership Funding and fully funded from national sources.

- Extensive consultation and public engagement activities have been initiated through the RTS. This is highly formalised in this case study, where all partners, stakeholders and interest groups have been involved in the decision-making process since the early design of the scheme. This is highlighted as an example of good practice.

5 Balancing flood risk with economic development through localised cooperation and innovative measures – A case study of flood risk governance in the City of Leeds

5.1 Introduction and scope of the analysis

This chapter summarises the main findings from empirical research conducted for the Leeds case study (as outlined in Chapter 1). Key socio-demographic and physical characteristics of the city are summarised in table 5.1. In particular we examine the decision-making processes surrounding the River Aire Flood Alleviation Scheme (RAFAS), which will for the first time see movable weirs used in the UK for a flood management function (Leeds City Council, 2014a). Drawing from in-depth policy and legal analysis, and semi-structured interviews with flood risk professionals (Table A1, Annex), this study examined the factors that influenced the innovative nature of the RAFAS. Also featured in this case study is an evaluation of spatial planning at the local scale, which was highlighted by other interviewees as an example of *good practice*.

Table 5.1: Key characteristics of the Leeds case study

Key facts and figures	
Region and county	Yorkshire, North East England
City population	750,000 (3 rd largest city in UK)
Population density	13.6 people per hectare
Elevation	Leeds city is located in topographic bowl
River basin	River Aire, 87approx. 1,100 km ² .
Properties at risk from a 1% flood (excluding presence of flood defences)	c. 4,725 properties
Types of flooding	Fluvial, surface water and groundwater
Index of Multiple Deprivation (where 1 indicates the highest level of deprivation, out of a possible 326 local authority areas)	Leeds district is ranked on average as 68 th

5.2 Contextual background of the case study

The city of Leeds is located in the county of Yorkshire in North East England (figure 5.1) and is recognised as an important economic driver in the North of the country. Economic growth and regeneration within the city is a key objective, but this must be balanced alongside the management of flood risk. There are a number of main rivers within the district; including the River Wharfe (in the north and east) and the River Calder (in the south), which joins the River Aire at Castleford (Environment Agency, 2010d). The River Aire drains two thirds of the district and flows directly through the city of Leeds. In the past, this has caused significant flooding, most notably in 1946, 2000 and 2007. Today, the Environment Agency estimates that there are 4,724 properties at risk from the 1 in 100 year fluvial flood event (assuming that no defences are in place) (Environment Agency, 2010d). The distribution of this risk across the River Aire catchment is illustrated in figure 5.2. The city itself is located in a topographic bowl and is also highly urbanised; together, these factors make Leeds highly susceptible to surface water flooding.



Figure 5.1: City of Leeds and the River Aire, UK

Source: MarCom-Carto – Faculty of Geosciences –Utrecht University

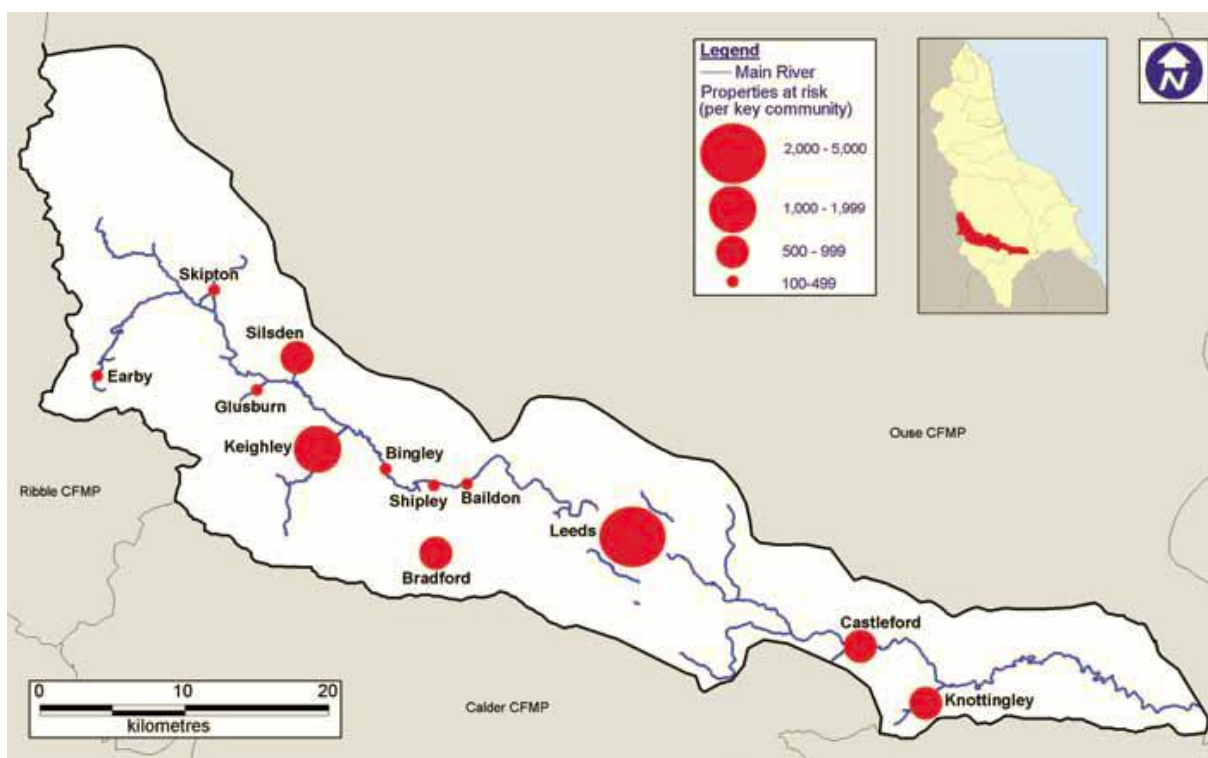


Figure 5.2: Number of properties at risk within the River Aire CFMP (assuming no defences are in place) (Environment Agency, 2010d)

To minimise the likelihood of flooding, there are currently 249 defences along the River Aire, with 70% of these providing at least a 1 in 50 year standard of protection (Environment Agency, 2010d). In addition to flood defence, all five of the STAR-FLOOD Flood Risk Management Strategies (FRMSs) are

embedded in the approach to FRM (Leeds City Council, 2014b). However, within Leeds city there are plans to take further action to reduce flood risk from all sources (Environment Agency, 2010d). Of interest to this research, is the River Aire Flood Alleviation Scheme (RAFAS) in Leeds city centre (Leeds City Council, 2014a)⁵⁶. When completed, the RAFAS will provide the city centre and 70 households with a 1 in 75 year standard of protection against flooding from the River Aire and Hol Beck, with £88,615 in economic benefits (see Environment Agency construction programme; HM Treasury, 2014). A diversified range of funding sources has enabled the implementation of this project (table 5.2). Construction began in January 2015 and will involve a number of different measures, including;

- The innovative use of movable weirs to regulate water levels for navigation and flood control. These will replace existing fixed weirs at Crown Point and Knostrop and allow river levels to fall by 1m in flood events;
- Removal of the island at Knostrop Cut to merge the River Aire with the canal;
- Flood walls and ‘hard landscaping’ in the city;
- A new fish pass.

A number of research questions are addressed through this case study (box 5.1). Firstly, this study investigates the factors that influenced the innovative nature of the RAFAS. Also examined, were the ways in which FRM is negotiated with economic development through spatial planning arrangements.

Table 5.2: Funding sources for the River Aire Flood Alleviation Scheme

Source	Amount (£m)	Amount (€m)
Department for Business, Innovation and Skills (BIS) – Regional Growth Fund	3.36	4.54
Department for environment, food and rural affairs (Defra) – Defra Growth Fund	23.00	31.05
Environment Agency Grant-in-Aid (GiA)	8.46	11.42
Leeds City Council	10	13.5
Total	44.82	60.51

Based on figures reported by the Environment Agency in the Flood and Coastal Erosion Risk Management Programmes of Work for the financial year 2015 to 2016 (Environment Agency, 2014d). Conversion to Euros based on exchange rate of 1.35.

Box 5.1: Research Questions (RQ) to address in Leeds, England

i.	What factors influenced the innovative design of the River Aire Flood Alleviation Scheme (RAFAS)?
ii.	What are the tensions/barriers encountered in delivering the RAFAS? How are these being resolved?
iii.	How is spatial planning balancing FRM with the need for economic growth? To what extent can spatial planning in Leeds be held-up as an example of ‘good practice’?
iv.	How have arrangements for flood risk governance evolved over time? What are the driving forces for stability and/or change?
v.	To what extent does the governance arrangement for FRM support societal resilience to flooding?
vi.	To what extent can flood risk governance be described as legitimate?
vii.	To what extent can flood risk governance be described as efficient?

⁵⁶ For further information on the RAFAS visit <http://www.leeds.gov.uk/residents/Pages/FloodAlleviationScheme.aspx>

5.3 Analysis of flood risk governance in Leeds

5.3.1 The River Aire Flood Alleviation Scheme (RAFAS)

This section addresses RQi-ii. In researching the factors that led to the innovative design of the RAFAS, it became apparent that the scheme has a long history, with the initial designs prompted by flooding in 2000. This event highlighted the vulnerability of the city centre in the absence of formal defences and mounting evidence for climate change. An initial feasibility study was led by the Environment Agency (EA) to examine various levels of risk, corresponding damages and potential projects to address these. It was determined that a scheme providing a 1 in 500 year standard of protection was actually the most cost-effective approach; however, this would involve the construction of flood walls that were several meters in places. Objections were raised by Leeds City Council (LCC), who felt that this would detach the city from the river, and undermine the character of the city and its cultural heritage. Therefore, options for a 1 in 200 year safety standard were explored, which would enable the height of the flood walls to be reduced. This scheme was the predecessor to the RAFAS and would cost an estimated £180m.

As discussed in Section 2.4, there was a shift in the rules governing the allocation of Grant-in-Aid funding (GiA) with the implementation of *Partnership Funding* in 2012. As a result of this, the 1 in 200 year scheme was deemed to be impractical and not cost-beneficial. Opposing this decision, a meeting was convened between local cross-party politicians, the EA, LCC, representatives from local action groups and the Secretary of State. The regional and national economic importance of Leeds was asserted and the Secretary of State agreed that money must be secured for a revised RAFAS. Although LCC applied for funding from the European Regional Development Fund (ERDF) (which was eventually awarded to the flood alleviation scheme in Hull; Chapter 3), money was eventually secured through the Regional Growth Fund (issued by the Department for Business, Innovation and Skills, or BIS; BIS, 2012). From speaking with key professionals in FRM, it was clear that the geographic importance of Leeds, in terms of regional and national economic growth, was the main driving factor behind this investment from BIS. Whilst this demonstrates a diversification of funders (as requested by Partnership Funding policy), it is noteworthy the RAFAS remains predominantly state-funded (table 5.2).

The RAFAS was revised to maximise the cost-benefit ratio and ensure the best use of tax payers' money. Rather than apply a fixed safety standard, the scheme is now based on the innovative use of moveable weirs and employs an adaptive management (multi-phased) approach. This means that the scheme can be adjusted over time to accommodate the effects of climate change. When asked what this might involve, key actors within LCC and the EA explained that a simple measure would be to raise the height of the flood walls along the River Aire. Although these actors acknowledged that this might conflict with the wishes of local businesses and residents, they had faith that new technologies or practices might emerge in this time. Indeed, the height of the flood walls has been the main source of local resistance to the RAFAS. In an attempt to remedy this, riparian businesses and developers have been given the option to fund glass panels to be included within the flood wall; although so far, there has been no uptake of this.

5.3.2 Spatial planning in Leeds

Although spatial planning governance in Leeds mirrors that described at the national scale (Section 2.3.1), there are some interesting nuances and issues. Leeds City Council is both the Local Planning

Authority (LPA) and Lead Local Flood Authority (LLFA). There is a long-term, well-functioning relationship between staff within the planning and FRM departments within Leeds City Council, and the local Environment Agency staff. Importantly, it was recognised that by working closely together each of these actors were able to provide a consistent message about the importance of managing flood risk.

Although flood risk is recognised as an important issue within spatial planning, managing development within a city centre location bisected by a major river is complex and challenging. Interviews highlighted that there are other key issues that are considered to be of greater priority; such as maintaining the settlement hierarchy⁵⁷ and supporting sustainable growth. The settlement hierarchy is considered before flood risk and arguably, if the order was reversed there would be a very different shape to urban expansion. Interviewees reflected on the importance of spatial planning in preventing economic stagnation on one hand, whilst preventing inappropriate (re)development in flood risk areas, on the other. Key actors involved in this process voiced concerns about the role and expectations of the independent planning inspectors in their ‘test for soundness’ of Local Plans and the subjectivity inherent within the consideration of flood risks within the National Planning Policy Framework (NPPF). Greater clarity was being sought by local authorities (including Leeds) about the importance and priority that should be given to flood risk, relative to other considerations. This was prompted by a situation that occurred in Doncaster whereby the Local Plan failed its test for soundness (and therefore was unable to be adopted), because the Planning Inspector believed that insufficient attention has been paid to flood risk. Perversely, as was the case in Doncaster, the failure to adopt a Local Plan (*i.e.* having an out of date local plan) weakens the position of the LPA to prevent inappropriate development in flood risk areas.

In general, however spatial planning in Leeds was considered to be working effectively. Firstly, the LPA takes into account the advice of the Environment Agency (both on the relevant specific planning applications as well as Flood Risk Standing Advice) and there are no instances where planning permission has been granted against the EA advice. Secondly, the LLFA is assisting the understanding of flood risk issues and commenting on the flood risk assessments within planning. There are also several examples of planning successes in Leeds, which provide exemplars of how economically important riverside regeneration can be permitted (*e.g.* through careful design and the consideration of floor heights). Interviewees within the EA and LPA described instances whereby redevelopment opportunities have been used (via spatial planning conditions) to reduce the risk of flooding at the site. Figure 5.3 illustrates a redevelopment site on the banks of the River Aire in Leeds city centre, whereby the developer has agreed to provide a 1 in 200 year standard of protection, exceeding the protection provided by the RAFAS.

⁵⁷ The settlement hierarchy is a key part of the evidence base for a Local Plan. It requires an LPA to consider the size of all of their settlements, their characteristics and their functions and to consider the sustainability of future growth. By examining the size and location of settlements it is crucial for understanding where additional development should be targeted (and will be sustainable) or where sustainability may be achieved through additional growth.



Figure 5.3: An example of tiered development by the edge of the River Aire and a redevelopment site which will include a flood protection standard of 1 in 200 years.

Despite these successes in planning, there is still the issue in Leeds of the potential for the increasing piecemeal development in areas at risk of flooding, as well as enforcement issues and ensuring that any conditions imposed to mitigate flood risk have been implemented and are effective (discussed in Section 2.5.1). The Leeds case study also demonstrates some of the critical issues which have been raised at the national level and in the other case studies. Firstly relating to how the Strategic Flood Risk Assessment (SFRA) is updated to reflect changes in risk and secondly, the temporal sequencing of plan development and updates. These emerged in discussions about the construction of the RAFAS, which is due to be completed in 2016. As part of this scheme, the removal of Knostrop Cut will provide additional areas for water storage and thereby reduce water levels in flood conditions (figure 5.4). Consequently for spatial planning, this will change the indicative mapping of locations in the different flood zones. New flood modelling has been undertaken and redefined the baseline for the undefended situation (*i.e.* without the RAFAS being implemented), as well as the impact on the flood extent with the removal of Knostrop Cut. These revisions should be represented within any new planning documentation. To prevent inconsistency with the published outlines the new undefended baseline is yet to be adopted by the Environment Agency and the reduced flood levels will only be realised in a number of months' time when works in this area are completed. However, there is the requirement that the LPA update their local planning documentation now. Importantly this includes the site allocation plan, which is used to guide new development and used within planning appeals to refuse permission. This highlights a common difficulty faced by LPAs when revising plans and core strategies; that their updates are often out of synchronisation with improved flood data and changes in mapping. Leeds City Council is working with the Environment Agency to find a resolution to this problem, but this is illustrative of the difficulties that can arise when two sub-FRGAs and policy domains overlap. Linked to the difficulties of harmonising updates were also concerns about the ease of update and the inclusion of new mapping within planning documentation which is often assorted, lengthy and with large file sizes.



Figure 5.4: Knostrop Cut (looking South East) which will be partially removed as part of the RAFAS to create additional water storage.

5.4 Explaining change and stability in flood risk governance in Leeds

Similar to the Lower Thames case study, this study demonstrates the impact of **funding changes** on the design and implementation of a flood alleviation scheme. In the case of the RAFAS, active lobbying to Government amongst local MPs and other vested stakeholders has helped get the scheme recognised as **nationally important**; leading to the allocation of money from the Regional Growth Fund. Underpinning this decision was the geographic importance of Leeds for the economy in the North of England. Simultaneously, **economic growth** was (and continues to be) a key political priority following the financial recession in 2008. A key point to observe is that changes in governance were *not* needed to drive through the RAFAS. Furthermore, this example demonstrates the importance of allying FRM with economic growth (as also demonstrated in Chapter 3 in the case of Kingston-upon-Hull).

The changes in the rules surrounding funding were a key driver for the redesign of the RAFAS and decision to adopt a lower standard of protection. This was a key **driver for innovation** and inclusion of moveable weirs. To a lesser degree, this decision has also been attributed to objections from the local businesses and community; albeit from our interviews this appears to have been a minor reason. Although these factors have not influenced governance, these observations demonstrate the influence of a range of factors upon the implementation of a flood alleviation scheme.

National level **discourses** (*i.e.* climate change, sustainability, adaptation) have also helped shape the design of the RAFAS and adaptive management approach that has been adopted at the local level. Another interesting factor is the impact of **technological advancement** in FRM; according to some interviewees, this is another reason for adopting an adaptive management approach, because it will

potentially enable emergent technologies to be integrated within the scheme. This demonstrates considerable faith in technological advancement and flexibility in the approach to FRM.

Flood events have both played a stabilising and driving role in FRM in Leeds. Although the flood in 2000 had a minor impact on the city, it was within ca. six inches of overtopping defence structures along the River Aire. This near-miss prompted the initial design of a flood alleviation scheme (and formal flood defences) for Leeds city centre. Although the Summer floods in 2007 bypassed the city centre, a nearby area called the Dunhills was badly effected and used as a case study in the Pitt Review (Pitt, 2008). However, according to some interviewees it was the impact of these floods in the nearby city of Sheffield that highlighted the vulnerability of Leeds and reinforced the need for action. Thus flood events need not occur in-situ to catalyse a response. However, despite the recent efforts to implement a flood alleviation scheme, it is also interesting to examine the reasons why no *formal* flood defences have existed until this point. In part, this reflects the difficulties of establishing a favourable cost-benefit ratio in an area that is principally businesses, but it also reflects the absence of significant flood events, which have created stability.

The role of **policy champions** is also evident. LCC were ahead of other LLFAs in England in adopting a local FRM strategy (as required under the FRR 2009; Leeds City Council, 2014b). This was facilitated by the proactivity of key individuals within LCC and close working relationships that have formed within and between the LLFA and EA. This has also been partially driven by **formal rule changes** (*i.e.* FRR 2009 and FWMA 2010), but from the perspective of Leeds City Council this legislation seems to have predominantly reinforced existing efforts to adopt a cohesive FRM strategy at the local scale. Nonetheless, the legislation is described as having an important role to play in justifying expenditure in FRM and helping to secure internal allocations of money within the LA at a time where budgets are being cut.

5.5 Evaluating flood risk governance in Leeds

Flood risk governance in Leeds was evaluated according to the extent to which it facilitates societal resilience (in terms of the *capacity to resist flooding; absorb and recover and adapt*) and whether it does so in an efficient and legitimate way. Further details are provided in Alexander and Priest (2015). This section reports the key findings only and complements the national-scale evaluation; unless stated otherwise, the features of governance reported in Section 2.5 are equally applicable here.

5.5.1 To what extent does flood risk governance enable societal resilience to flooding in Leeds?

- I. The capacity to *resist* flooding is supported through a network of informal flood defences along the River Aire. Reinforcing this further, the implementation of the RAFAS will provide a 1 in 75 year standard of flood protection in the city centre. In the meantime, the City remains somewhat vulnerable to flooding, reinforced through recent near misses.
- II. Importantly, the RAFAS scheme adopts an adaptive management approach and has scope for revision over time, such that the safety standard could be enhanced to accommodate changes in the socio-environmental system or integrate new technologies. This flexibility is a necessary criterion for strengthening *adaptive capacity* and the ability to manage flood risks

in the future. Furthermore, periodic scrutiny of this strategy helps create a process of critical reflection and institutional learning.

- III. Efforts have been made to enhance public awareness of fluvial risk and the RAFAS; however, there is a concern that the construction of the RAFAS could instil perceptions of flood safety amongst the general public. Other researchers have observed the impact of ‘visible’ flood defences on risk perception, but this could also lessen motivation to adopt property-level measures at the business and household scale; thus heightening social vulnerability (Alexander, 2014).

5.5.2 To what extent can flood risk governance in Leeds be described as efficient?

- IV. The original proposal for a River Aire flood alleviation scheme has been revised on several occasions and the standard of protection downscaled to the current 1 in 75 year on the basis of cost-benefit analysis. As is characteristic of the national FRGA, economic efficiency is a pivotal concern in FRM. Moreover, the application of an adaptive management approach means that this can be reviewed and adjusted over time.
- V. Responsibilities for FRM within Leeds City Council are divided within a dedicated FRM team and an additional team for large-scale project management (responsible for the RAFAS). This creates an ‘*efficient division of labour*’ (flood risk manager, LCC) and enhances resource efficiency.
- VI. Within the sub-FRGA for spatial planning, relationships have been forged between the LPA, EA and developers, which have enabled risk-sharing arrangements to emerge whereby developers had adopted defence or mitigation measures to minimise the risk to new developments or redevelopments.
- VII. Similar to that reported in Hull (Chapter 3), the resource-intensive nature of the bidding process for funding was identified as an area of inefficiency. This was keenly expressed by LLC, who had also applied to the European Regional Development Fund and was unsuccessful (where the WaDFAS was awarded to East Riding of Yorkshire Council).

5.5.3 To what extent can flood risk governance in Leeds be described as legitimate?

- VIII. In terms of *social equity*, a condition was attached to the planning permission for the construction of the RAFAS that it should not increase the risk of flooding downstream. As a result of this, the town of Woodlesford has been protected to a 1 in 200 year standard of protection, which would not have otherwise been granted had the scheme not been in place due to an insufficient cost-benefit ratio. Although this condition was primarily enforced to negate potential liability concerns, it has also ensured that certain areas are not protected at the expense of others and supported a socially just approach to FRM.
- IX. Another facet of legitimacy is the presence of *public participation*. Numerous methods have been employed to engage with local businesses and people to raise awareness of the RAFAS and provide opportunities to critique the scheme (e.g. one-to-one meetings). On the basis of

public consultation, local knowledge has been assimilated to revise aspects of the scheme. This has also gone some lengths towards facilitating public *acceptance*.

- X. *Transparency and accountability* in FRM is also an important criterion for legitimacy. On this front, a scrutiny board is convened periodically to review the implementation of the local FRM strategy (Leeds City Council, 2014b) and is open to the public and press. Crucially, this is viewed within LCC as an opportunity for learning and improving the local strategy to enhance societal resilience further.

5.6 Conclusions

Returning to the research questions, the following conclusions can be drawn from this case study:

- The *regional* and *national* economic importance of Leeds was a key driving factor behind the implementation of the River Aire Flood Alleviation Scheme (RAFAS). Although funding sources have diversified, this project is funded predominantly by public monies.
- The innovative nature of the RAFAS has emerged from efforts to improve the cost-effectiveness of the scheme and rule changes in funding. To a lesser degree, public opinion also influenced the design of the scheme.
- This case study provides some exemplars for how economically-important riverside regeneration can be permitted (*e.g.* through careful design and the consideration of floor heights); as well as instances where redevelopment opportunities have been used (via spatial planning conditions) to reduce the risk of flooding. Relationships forged between the LPA, EA and developer is crucial for incorporating resilience principles within the landscaping and design of new developments.

6 Explanations for stability and change in flood risk governance

6.1 Introduction

Governance dynamics in English flood risk governance are characterised by incremental change, primarily at the sub-FRGA level. The structure and composition of flood risk governance at the national level has become increasingly diverse, but at the same time comprehensive, as recognised ‘gaps’ in governance have been filled (Section 2.4). Furthermore, recent observed changes to governance highlight the increasing alignment and co-ordination of the system, enabling the different sub-FRGAs to work together more effectively. In general, there has been a high level of consistency between governance dynamics in the case studies and at the national level, with the case studies displaying many of the same trends and explanations for change. This chapter focuses on some of the key trends in flood risk dynamics over the recent past (c. 15 years) and the key explanatory factors, both endogenous and exogenous, that have shaped change and stability. These are summarised in table 6.1. Importantly, many of these identified changes in governance are interlinked. This would be expected in a mature flood risk management approach such as in England and one dominated by incremental change, rather than more distinct shifts.

Table 6.1: Explanatory factors that have shaped change and stability in flood risk governance over the past 15 years (with a focus on key factors, only)

	Drivers of stability	Drivers of change
Endogenous factors	<ul style="list-style-type: none"> ▪ Responsibility for flood risk management retained with the landowner under Common Law; ▪ Consistent application of economic prioritisation for flood risk decision making; ▪ Past investment in flood defence infrastructure (‘sunk costs; ‘lock in’ and path dependency); ▪ Policy inertia; ▪ Self-reinforcement of expertise (<i>i.e.</i> as EA gains experience they are seen to be the flood management experts and so gain further powers and responsibilities); ▪ Wide inclusion of actors and broadening of the flood management community; ▪ Role of vested interests, power elites and advocacy coalitions in maintaining the status quo; 	<ul style="list-style-type: none"> ▪ Centralisation of management and the funding of FRM; ▪ Recognition of the importance of community-scale flood management; ▪ Significant flood events (such as 2000 and 2007) – in general acting as policy windows, and/or the acceleration of policy change. Also highlighted governance ‘gaps’ (<i>e.g.</i> surface water management); ▪ Impact of the media and 24 hour news coverage on exerting political pressure and framing the issue to the public; whilst this is broader than flood issues, it is particularly prevalent during the coverage of flood events. ▪ Roles of reviews, committees and public inquiries; ▪ Growth of a flood management community (driving innovation and changing policy agendas); ▪ Technological advances and availability of data; ▪ Policy entrepreneurs and champions; ▪ Role of vested interests, power elites and advocacy coalitions enabling or pushing for change;
Exogenous factors	<ul style="list-style-type: none"> ▪ Policy making culture; ▪ Legislative processes; ▪ Absence of a written constitution; 	<ul style="list-style-type: none"> ▪ Strength in international discourses relating to climate change, societal resilience to disaster risk and social,

	Drivers of stability	Drivers of change
	<ul style="list-style-type: none"> ▪ Lack of government compensation and the continued inclusion of flood as a standard peril within insurance policies; ▪ Dominance national decision making towards the 'national' or 'public' interest. 	<p>economic and environmental sustainability;</p> <ul style="list-style-type: none"> ▪ Changes to wider political ideologies and prevailing discourses (e.g. centralisation, privatisation, and Localism) ▪ Openness of policy debates ▪ External shock events (including the Global Financial Crisis) ▪ Technological and scientific developments and innovation. ▪ Normative shifts in attitudes towards participation and inclusion of multiple actors. ▪ Only minor changes have been driven from EU Floods Directive.

6.2 Trends and explanations for change

6.2.1 Stronger and centralised role of the Environment Agency

The Environment Agency's remit and powers have broadened and increased significantly since their creation in 1996. This actor can now be seen as the central organisation for the operational delivery of flood risk management and importantly has a key role to play in the majority of the sub-FRGAs in England. EA involvement is recognised as providing consistency in all areas of flood risk management and is one factor which enables the diverse national governance arrangement in England to function effectively. Furthermore, the maturing of the organisation over the years, and the overview of FRM that the EA now has, has brought an increased professionalism to FRM in England. The EA's evolution into the key organisation has been mainly incremental in nature with the accretion of additional powers occurring gradually. The increased role of the EA has been mirrored by a reduction in influence and remit of the Regional Flood and Coastal Committees (previously Regional Flood Defence Committees). Conversely, however, over this period the geographical influence of the Environment Agency has reduced with powers for flood risk management in Wales⁵⁸ being further devolved.

Key explanatory factors:

- Response to recognised gaps in governance (e.g. flood warning, flood mapping);
- Self-reinforcement of expertise (i.e. as EA gains experience they are seen to be the flood management experts and so gain further powers and responsibilities);
- Linked to the 'pulling back' by Defra due to budget cuts and a broader erosion of direct government responsibilities leading to a movement away from government ministries towards other Agencies and Trusts (e.g. healthcare and education);
- Pitt review recommendations following the 2007 floods reinforce the importance of EA as a key actor and their oversight (Pitt, 2008; recommendation 2⁵⁹).

⁵⁸ Flood risk management powers in Scotland have been devolved for a longer period.

⁵⁹ "The Environment Agency should be a national overview of all flood risk, including surface water and groundwater flood risk, with immediate effect" (Pitt, 2008; recommendation 2, p. xii).

6.2.2 Broadening the funding for flood risk management: Introduction of Partnership Funding

A desire to broaden the funding sources for flood risk management has led to the introduction of the Flood and Coastal Erosion Resilience Partnership Funding policy (Defra, 2012b; Section 2.3.2). This approach aims to move funding away from a reliance on centralised funding, towards local funding and private monies. However, evidence from the first years of implementation highlights that the majority of spending is still from ‘government’ monies and that the impact of alternative sources have been minimal. Despite this, this does not mean that *Partnership Funding* has not had an impact, the approach has fundamentally changed the attitudes and aspirations of individuals and communities about flood risk management and the funding system has opened up the possibility to obtain the approval for schemes which otherwise may not have been funded (such as the RTS; Chapter 4).

Key explanatory factors:

- The Global Financial Crisis (GFC) occurring in 2007/8 – reduction in public spending and cuts in government expenditure;
- Awareness of future flood risks and recognition of the insufficiency of government funding to meet FRM;
- Linked to the broader move towards increasing local responsibility in FRM.

6.2.3 Increasing transparency of flood risk management and attention towards the management of future flood risk

Much greater attention is being paid towards the awareness and understanding of flood risk in general, and more specifically future flood risk. This period is characterised by the release of much more flood risk information, both to professionals and the public (*e.g.* publically accessible flood maps, National Flood Risk Management Strategies (*e.g.* EA, 2009a; EA, 2010e; Defra/EA, 2011a) flood warnings provided via multiple channels). More recently, awareness and understanding has included a greater consideration of future risks. The Foresight initiative (Evans *et al.*, 2004; updated in 2008, Evans *et al.*, 2008) provided the first comprehensive assessment of future flood risks in England. This has been followed with flooding issues being increasingly tied to the initiatives to manage climate change which has been a broadening area of concern. The Climate Change Act 2008 established the National Adaptation Programme and the Climate Change Risk Assessment of which flood risk is embedded within the national adaptation policy (*e.g.* HM Government, 2012a). The Act has also seen the creation of the Committee on Climate Change (CCC) (an independent, statutory organisation) and the organisation’s Adaptation Sub-Committee have been particularly active in researching future flood risk issues (or commissioning research) and providing advice to government about how to manage them (*e.g.* Krebs, 2013; ASC, 2014). The result of this is that resilience and adaptation are now well-established as part of the discourses in which flood risk management is framed.

The increased availability of information about flood risk, both current and future, has ‘opened up’ the issue of flood risk management into the public domain. The governance around flood risk management is as transparent as it has ever been and has received government and public scrutiny from bodies such as the National Audit Office (NAO, 2007; 2011) and the Audit Commission (Audit Commission, 2007). These changes also reinforced the need to formally respond to criticisms after flood events and in particular enabled the creation of an independent review following the 2007

floods (Pitt, 2008) whose recommendations were a recent major factor leading to many governance changes.

Key explanatory factors:

- Technological advancements – improvement of the flood risk information products being delivered (*i.e.* the modelling and mapping) and channels through which it is delivered (*i.e.* wider use of the internet and other communication mechanisms);
- Broader concern and understanding of climate change;
- Recent large flood events (such as 2000, 2007 and 2014) and the related concern by professionals with FRM responsibilities, communities and the media;
- Linked to the discourse and actions towards making flood risk management responsibilities more local (see Section 6.2.4), with the understanding of flood risks being seen to be critical to people taking responsibility.

6.2.4 Inclusion of a greater numbers of actors and power changes between actors

The number and diversity of actors in flood risk management has increased in most areas of flood risk governance. Additionally, there has been a greater formalisation of some actors' roles and responsibilities. For instance, there has been a rise in the number of established Flood Action Groups and, as such, community involvement in flood risk management. However, the reasons for their creation and their roles in FRM are varied (Geaves and Penning-Rowsell, 2015). The increasing number of actors can be in part explained by the diversity of flood risk governance arrangements, but is also indicative of the more general move towards increasing participation in all areas of policy-making. Indeed, public participation and consultation have been evident for many years in FRM and in particular when large-scale structural projects are implemented. Furthermore, the findings from the Pitt Review (Pitt, 2008) also recommended a new approach towards partnership working and the drawing together of different actors more formally into the governance structure of FRM. Two other reasons for the increase in actors are fundamentally linked to two broader observations of change within English FRM.

Increasing attention towards managing all sources of flooding (in particular with greater attention to surface water flooding):

One recent trend has been the increasing attention being given to the importance and management of all sources of flooding and in particular an increasing focus on urban surface water flooding, which has brought many different actors into the core of flood risk management. The FWMA 2010 clarified (and strengthened) the responsibilities of local authorities for managing local flood risks and has seen the (re)enforcement of Sustainable Urban Drainage within the spatial planning process.

Key explanatory factors:

- Surface water flooding damages occurring during the Summer 2007 floods and the related Pitt Review recommendations (Pitt, 2008);
- Improved technology and the ability to assess surface water flood risk and the ability to forecast heavy rainfall. The last 15 years have seen significant improvements in flood risk modelling and for the first time (and reinforced by Recommendation 5 of the Pitt Review) a national flood risk assessment for surface water flood risk was performed and has been

subsequently improved and revised (EA, 2013b). These efforts highlighted for the first time just how many properties are at risk of surface water flood risk;

- Strengthening policy and action towards fulfilling the discourse of managing the ‘whole’ flood problem being recognised by *Making Space for Water* (Defra, 2004).

Reinforcing the role of community and individual responsibility and the ‘local’ in flood risk management:

Recent years have seen a discourse towards reinforcing the role of individual and communities’ responsibilities managing their own risk. The growing importance of communities is recognised in national strategies (e.g. Defra/EA, 2011a), has been promoted through a range of initiatives developed by flood risk managers (e.g. Resilience pilots, Defra, 2008b; Community Emergency flood plans, EA, 2012a; Defra Community Resilience Pathfinder Scheme, Twigger-Ross *et al.*, 2014) and is observed by communities developing their own flood risk management approaches. Coupled with this, the FWMA 2010 (re)strengthened the importance and responsibilities of local authorities in flood risk management. This focus on local and community flood risk management, however, is nothing new to the English approach, but is more of a re-emphasising more traditional notions.

Key explanatory factors:

- Linked to increasing the resources available for management and the shifting of the financial burden towards local beneficiaries (e.g. *Partnership Funding*);
- Recognition that some flood issues can, and are, best managed at the local level and that community involvement will always be required to manage residual risk. Therefore, a key aspect of FRM is community resilience.

6.2.5 Strengthening the role of spatial planning and prevention in flood risk management

Spatial planning has for many years been a cornerstone of flood risk management. However, the last 15 years have seen a strengthening and consolidation of the policy and rules surrounding new or re-development in flood risk areas, recognising the importance of *prevention*. 2001 saw the introduction of *Planning Policy Guidance (PPG) 25* (DTLR, 2001) which was subsequently refined and added to by *Planning Policy Statement (PPS) 25* (DCLG, 2006). These policies have formalised and strengthened the role of the Environment Agency to object to (and provide advice about) proposed (re)development in flood risk areas, gave the Minister specific powers to ‘call in’ proposals for further scrutiny and introduced the key instruments of the Sequential and Exception tests, the Strategic Flood Risk Assessment and the Flood Risk Assessment. These were all introduced to strengthen the ties between managing flood risks and spatial planning and preventing the increase in numbers of properties in flood risk areas.

Key explanatory factors:

- Criticisms following the autumn 2000 floods which focussed on the high number of properties continuing to be built in high flood risk areas is one explanation – but the policy was drafted months prior to the event. The 2000 event was a ‘policy window’ and subjected the policy to greater parliamentary scrutiny;
- Technological improvements and advances in the ability to assess flood risk. The development and release of the first national indicative flood map occurred in 1999. This

highlighted the significance of new development in the floodplain and was a tool for planners to use to consider flood risks for planning applications;

- Attention of other actors, importantly the insurance industry, who began to lobby for a more robust approach to planning in flood risk zones.

6.3 Key factors of stability

The following sections will identify and explain the key factors of stability that have been impacting the English flood risk governance arrangement over the past c. 15 years.

6.3.1 Maturity and relative success of existing flood risk governance approaches

The maturity of the English FRM approach and its relative success in reducing flood risk and the impacts from flooding is one of the key stabilising factors for English flood risk governance. England has suffered a number of floods over this period considered to be of a national significance (*e.g.* 2000, 2007 and 2014). Despite this, the flood risk management approach has not been destabilised and resultant changes have not fundamentally altered the FRM approach but have focused on strengthening or clarifying existing arrangements or filling ‘gaps’ in governance. This has led to a dominance of incremental change with more minor refinements of the approach as existing approaches are added to or tailored, rather than any fundamental shifts. There is also the recognition that the highest fluvial and coastal flood risks in England are already being managed, although the future effectiveness of this management needs to be assured, this provides a further stabilising factor for the current approach.

6.3.2 The continued provision of a private-market system of insurance and the lack of government compensation

A key stabilising factor has been the presence of a private-market system of insurance for the whole of the period of interest and the cross-subsidisation of high risk properties that the system provides. This sub-FRGA has been very stable since the early 1920s with very few significant changes until recently with the advent of Flood Re, which is still in the process of implementation. The consistency within the recovery system has provided an overarching stabilising factor to the whole national flood risk governance arrangement and in many ways has provided an effective back-stop to the rest of flood management and has meant that government has had a consistent ‘hands-off’ approach to individual flood recovery. The presence of a well-functioning system of insurance has meant that the losses to central government and HM Treasury following a flood event have been relatively low (*e.g.* one interviewee suggesting that in 2007 it was less than 5% of the total losses). One obvious difference in comparison to other countries has been the absence in England of any compensation for flood victims for their losses. This reinforces the traditional emphasis on it being the individual property/land owners’ responsibility to mitigate the risk of flooding. For many years it was in the vested interests for both insurers and the government to maintain the status quo. Flood Re (Section 2.3.7) on the face of it appears to be a major change in governance with the introduction of new rules, actors and in some ways requiring additional resources for the running of the scheme. However, in reality in the short term it will maintain the status quo and is merely formalising the cross-subsidy for properties in high risk areas. However, as premiums increase in future years during the transitional period, the impact of these changes on flood recovery will become more pronounced. Penning-Rowsell *et al.* (2014) explore in detail the reasons for the changing nature of flood insurance policy over the last 50 years and highlight a number of key factors which combine to

explain the change and timing of change to flood insurance provision. The key factors identified include: endogenous factors (technological improvements in flood risk assessment and insurers' concerns about their current and future exposure, recent losses sustained in flood events and in particular Summer 2007) and exogenous factors (the changing nature of the insurance market and the imbalance in flood risks liability by new entrants to the market and established insurers).

6.3.3 Continued government investment in flood risk management with a dedicated budget and a reliance on economic prioritisation

A critical influence on flood management from the outset of FRM has been government funding and the use of economic prioritisation within decision-making. Government intervention in FRM emerged in the 1930s, including the part funding of flood alleviation works from general taxation; investment which still continues today. Although the absolute level of government funding has increased or decreased along with political priorities (and in particular the recency of flood events) a significant stabilising factor to flood risk management has been the continuity of a dedicated budget and the consistency of FRM investment and resources. Indeed, this consistency has been strengthened further through the recent adoption of a 6-year rolling programme of investment.

The long-term use of economic prioritisation (and latterly CBA) highlights that the English approach to flood management is founded on the central management principle that not all risks can be managed and that difficult decisions need to be made. Fundamentally, although there have been some minor changes to the prioritisation process, ultimately the rules for cost-benefit analysis have remained unchanged since the introduction of the government's Policy Appraisal Guidelines (MAFF, 1999a; 1999b; 2000a; 2000b; 2001a; 2001b). Although in general a stabilising factor, the use of economic prioritisation, and specifically benefit-cost analysis, promoted the consideration of diversity. This was because an early requirement from the Ministry obligated any proposed project to show that a range of options had been considered before one option was put forward for funding. Indeed, this increasing move towards developing portfolios of options (including non-structural solutions) has been increasingly reinforced in England in a consideration of which suites of measures most effectively and efficiently manage flood risk. Thus economic prioritisation as an approach is both a key constraining and enabling factor within flood risk governance.

6.4 Conclusions

Governance dynamics over the past 15 years can be attributed to a range and endogenous and exogenous factors, as summarised in table 6.1. The past 15 years has been characterised by shifts in actors and power, as well as more recent changes to the allocation of funding. These shifts mirror the devolution of responsibilities towards the local scale. However, despite the *localism* rhetoric, power remains largely centralised and the majority of defence/mitigation schemes continue to be funded by public money (albeit from diversified sources). In relation to the rules dimension of the PAA framework, although there has been some consolidation of rules within legislation (e.g. Civil Contingencies Act 2004, FWMA 2010, Water Act 2014), this analysis reveals the dominance of policy changes, rather than legal modification. From a resource perspective, technological advances in flood risk modelling, mapping and forecasting have had a demonstrable impact of flood risk governance (Priest *et al.*, 2015). Finally, in terms of discourses, it is evident that *sustainability*, *natural flood management*, *climate change*, *partnership working* and *localism* have strengthened in this period. However, discursive shifts have not always been reflected in practice and a lack of resources has meant that many desired changes have as of yet failed to materialise into tangible FRM outcomes.

7 Evaluation of flood risk governance in England: Summary of strengths and weaknesses

This research has evaluated flood risk governance at both the national and case study scale, in terms of i) the extent to which it enhances societal resilience to flooding and does so in an ii) efficient and iii) legitimate way. Drawing these insights together, this chapter summarises the key strengths of English flood risk governance and highlights examples of good practice. Balancing this critique, weak spots in the national governance arrangement are identified to inform recommendations for strengthening flood risk governance and the delivery of FRM (Chapter 8).

Table 7.1: Strengths and examples of good practice within flood risk governance in England

Key strengths and good practice examples
<p>There is a strong steer from national policy-makers for holistic FRM to ensure that both the likelihood and consequences of flooding are addressed. All FRM strategies are regarded as equally important (see (i) Section 2.5.1). This promotes societal resilience through the use of strategies (and corresponding measures) that enhance the capacity to resist flooding, as well as absorb and recover when flood events occur.</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - The national strategy for Flood and Coastal Erosion Risk Management in England provides a strategic overview. FRM at the local scale must be consistent with this under the Flood and Water Management Act 2010.
<p>There is a dedicated budget at the national scale to fund Flood and Coastal Erosion Risk Management (FCERM) to support the capacity to resist flooding.</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - A six year Investment Plan secures funding for flood defence and mitigation schemes (Defra, 2014b). This provides a degree of certainty not previously possible when funding was subject to annual review and has the potential to facilitate efficiency by enabling RMAs to ‘package’ projects and source competitive prices from suppliers under long-term contracts (see (x) in Section 2.5.2). - Whole-life costing is common practice to determine the most cost-effective approach by taking into account the benefits of alternatives, routine maintenance as well as capital replacement and improvement for the life of the asset. This encourages long-term cost-effectiveness and economic efficiency (see (ix) Section 2.5.2). - Weighting is assigned towards areas of high deprivation to minimise social inequalities (see (xiii) Section 2.5.3; Defra, 2011b). - Managed adaptive approaches are advocated for large-scale schemes and instil a degree of flexibility to adjust responses according to changes in conditions (e.g. Thames Estuary 2100 project; see (viii), Section 2.5.1)
<p>Partnership Funding requires a diversification of funding sources, thus reducing reliance on FCERM Grant-in-Aid and enabling more defence and mitigation projects to be delivered.</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - There are examples of successful Partnership Funding through diversified sources of public money, such as the Willerby and Derringham Flood Alleviation Scheme (Chapter 3) and River Aire Flood Alleviation Scheme (Chapter 5). - There are other examples where the private sector has contributed (e.g. Nestlé and the Lower Dove Flood Alleviation Scheme; see (x), Section 2.5.2).
<p>Risk-based prioritisation guides decision-making and supports the efficient use of resources.</p>

Key strengths and good practice examples
<p><u>Good practice:</u></p> <ul style="list-style-type: none"> - The absence of universal standards of protection means resources can be distributed on a needs-basis. - The formation of Community Risk Registers supports proactive emergency planning that is proportional to the risk at hand (Section 2.3.5).
<p>Flood forecasting is highly developed in England and utilises state-of-the-art technologies to improve the accuracy of forecasts as well as communicate uncertainties.</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - The Flood Forecasting Centre provides a dedicated service for flood forecasting, uniting expertise within the Met Office and Environment Agency (Section 2.3.4). - Multiple forecast products are produced for different types of risk (fluvial and coastal flooding, and severe weather), with various lead times to enable proactive incident planning.
<p>A clear framework of responsibilities exists for the dissemination of flood warnings to the public and flood risk professionals. Multiple pathways of communication are employed to access a range of social groups and minimise exclusion.</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - Contracts with telecommunication providers to deliver and an 'opt-out' service for landlines. This has been recently extended to mobile devices in limited areas to maximise the reach of flood warnings. This is crucial for enhancing societal resilience (see (v), Section 2.5.1). - Flood warden schemes have developed in at-risk communities, where community-based volunteers act as conduits between official warning messages and the local community (Section 2.3.8).
<p>Proactive FRM is promoted through national policy, with an emphasis on sustainability and planning for uncertain futures. This promotes forward-thinking, essential for strengthening adaptive capacity and societal resilience long-term.</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - Catchment Flood Management Plans produced by the Environment Agency recommend current and future strategies for managing flood risk over the next 50 to 100 years. - The Long-Term Investment Strategy evaluates the impact of different investment scenarios on FCERM over the next 50 years and determines a strategy for investment to maximise benefits (Environment Agency, 2014a). This steers the allocation of FCERM Grant-in-Aid. - UK Climate Change Risk Assessment 2012 establishes national priorities for adaptation and is reviewed every 5 years (as requested in the Climate Change Act 2008). Flood risk is embedded in this assessment. - Local Resilience Fora are required to develop Community Risk Registers to inform adequate emergency plans for generic and hazard-specific risks. Sub-groups within the LRF are formed according to these risks to provide specialist training and exercising.
<p>There is an established culture for integrated, partnership-based working between multiple actors to support informed decision-making as well as the efficient use of resources (see (xi), Section 2.52).</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - Local Resilience Fora facilitate integrated emergency management between Category One and Two Responders, as required by the Civil Contingencies Act (Contingency Planning) Regulations 2005.
<p>Public participation is well established and enhances legitimacy in flood risk governance (see (xvi), Section 2.5.3).</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - A diverse range of participatory activities are evident in the development of flood alleviation schemes (as

Key strengths and good practice examples
<p>highlighted in Chapters 3-5). These facilitate public understanding of local flood risk as well as understanding and acceptance of new schemes. In turn, public participation has also influenced various aspects concerning the design of flood alleviation schemes.</p> <ul style="list-style-type: none"> - New policies, plans (e.g. Catchment Flood Management Plans) and strategies (e.g. Local Flood Risk Strategy) are open to public consultation and scrutiny.
<p>Considerable efforts are made to increase flood risk awareness at the household and community scale, including the appropriate actions to take to minimise the likelihood or magnitude of flooding, or to reduce flood damages. Resources are available to support community-based action (see (vi), Section 2.5.1).</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - Dedicated community engagement officers exist within Local Authorities and the Environment Agency. - The 'Floodwise' national campaign launched by the Environment Agency (2009-2012) utilised marketing and targeted community engagement (especially vulnerable groups) to facilitate risk awareness and empower local communities to take measures to enhance their resilience. This had a demonstrable impact on numbers of people signed-up to the flood warning service and developing personal and community flood plans (Environment Agency, 2009a). - Online mapping of flood risk based on postcode search to make this information easily accessible. - A strategic national framework on community resilience exists as part of the Community Resilience Programme in England (Cabinet Office, 2011c). Through this programme a number of resources have been made available to local communities to support community-based activities to enhance preparation and response to emergencies, including <i>Preparing for emergencies – Guide for communities</i> (Cabinet Office, 2011d) and the <i>Community Emergency Plan Toolkit</i> (Cabinet Office, 2011e). - Guidance to support community flood plans is provided by the Environment Agency (2012a) - An established national charity, the National Flood Forum, provides support for at-risk communities and those that have experienced flooding. The charity provides advice to help people to prepare and recover from flooding, as well as guidance for households/communities on possible actions to reduce their flood risk.
<p>The high penetration of flood insurance to support recovery and help households and businesses to financially bounce-back from flood events (see (vii), Section 2.5.1). Moreover, this reduces the State's exposure to flooding and minimises State losses.</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - The introduction of Flood Re aims to ensure that flood insurance is accessible and affordable to all (under the Water Act 2014). Flood Re will be a pool-backed system whereby the premiums of properties at high risk will be capped and subsidised by the pool. In theory, Flood Re could represent an example of good practice; however, there are some concerns about how this will be implemented in practice and whether this new insurance/reinsurance scheme is doing enough to encourage adaptation at the household scale.
<p>Resilience is embedded within the management of critical infrastructure to minimise disruption caused by flooding.</p> <p><u>Good practice:</u></p> <ul style="list-style-type: none"> - The national infrastructure resilience programme promotes the integration of resilience within infrastructure business planning (Cabinet Office, 2011b). Lead Government Departments are required to produce annual resilience plans for each infrastructure sector in an effort to monitor resilience and identify areas for improvement.
<p>Flood risk governance can be regarded as highly legitimate in terms of transparency, accountability and procedural justice (Section 2.5.3).</p> <p><u>Good practice:</u></p>

Key strengths and good practice examples

- Independent reviews (e.g. Pitt Review, 2008) and public scrutiny of significant flood events (Efra Committee, 2015) reveal strengths and weaknesses in FRM and identify lessons to be learned
- Flood risk maps are publically available online. The Environment Agency website illustrates risk based on a postcode search to make this information easily accessible.

Although there are considerable strengths within the English system, this research has also identified a number of weaknesses and current concerns in flood risk governance. These are summarised in no particular order, below:

- Although the introduction of Partnership Funding can be regarded as a strength of current flood risk governance, there are clear concerns about the extent to which money can be raised at the local level; the River Thames Scheme is a good example of this (Chapter 4). Further concerns are raised about securing additional contributions from the private sector and the absence of a strategy and clear incentive mechanism for achieving this if Defra is unable to attract the £600m from private funders as outlined in the national Investment Plan (see (x), Section 2.5.2).
- There is widespread concern about the funding available for maintaining existing flood defences in England (see (ii), Section 2.5.1). Exacerbating this concern, revenue and capital budgets are allocated on different timescales (*i.e.* annually vs a six year spending programme, respectively). This was highlighted by flood risk professionals in this study as a weakness in the current system. Long-term planning for asset maintenance is equally required.
- Provisions for sustainable urban drainage are implemented within the spatial planning system, but it is too soon to evaluate the effectiveness of this approach (see (iii), Section 2.5.1). However, this study highlights concerns relating to the loss of a legal framework to support this, preference towards development, and perceived constraints on resources within the Local Authority and Environment Agency to adequately review and enforce planning conditions. Monitoring is required to track the effectiveness of this approach and ensure that problems are not simply stored-up for the future.
- From national and case study research, there is a perceived lack of resources within Local Authorities to support their new responsibilities in local FRM, including reductions in Local Government Finance Settlement⁶⁰, the loss of drainage expertise within LAs and limits to the support provided by the Environment Agency (due to their own resource constraints). Despite online knowledge resources (see (viii) in Section 2.5.1) and the completion of a New Burdens Assessment⁶¹ in April 2015, this research reveals a widely-held perception amongst practitioners that financial resources are significantly lacking.

⁶⁰ The Local Government Finance Settlement refers to the annual determination of funding to Local Government.

⁶¹ New burdens on Local Authorities (*e.g.* duties, new powers and targets) must be adequately assessed and funded by relevant Government Departments (DCLG, 2011c). The New Burdens Assessment conducted in April

- There are some reported difficulties in delivering integrated working between water companies and other Risk Management Authorities (elaborated in Section 3.3.2). This seems to be related to the different modes of governance through which these actors operate. As a quasi-commercial actor, water companies adopt a corporate mode of governance and are driven by business principles, short-term cost-effectiveness and customer satisfaction, as well as their regulatory functions. This means there is greater incentive to invest in traditional sewage and drainage infrastructure rather than diversifying to more natural forms of FRM.
- There appears to be a consensus amongst the majority of flood risk professionals interviewed as part of this research that FRM should strive to achieve multi-benefits through more integrated Catchment Based Approaches (e.g. improving water quality and the natural environment). The inclusion of different policy sectors could also unlock additional funding sources. Despite this considerable potential, examples of this in practice are few. It is clear that further evidence is required to demonstrate the extent to which cross-sectoral CaBA could alleviate flood risk (see (xii), Section 2.5.2). There is also a need to advance methods for cross-sectoral Cost-Benefit Analysis.
- The high penetration of flood insurance is a strength of English flood risk governance in terms of enhancing financial recovery. However, the insurance industry was also criticised by flood risk professionals and academic experts during workshops as failing to do more to encourage the uptake of adaptive property-level measures to reduce flood risk. Flood Re is designed as a financial measure to buy time and enable measures to reduce risk to be put in place over the next 25 years to create a more sustainable insurance market in the future (NFF, 2015). However, Flood Re makes no formal provisions for property-level protection measures or ‘betterment’ of properties following flood events (see (vii), Section 2.5.1). This is regarded as a missed opportunity to encourage flood risk awareness and promote adaptive development, as opposed to continuing to support a ‘return to normal’ model of resilience. There are also practical concerns about the implementation of Flood Re and subsequent transition to risk-reflective pricing. Significant modifications are required to ensure that we do not return to the current insurance system as is, but maintain access and affordability of flood insurance (also echoed by Grant and Chisholm, 2015; NFF, 2015).
- There is an expectation amongst *some* groups in society that the State should defend against flooding. It seems that a proportion of the general public is unaware that there is no statutory right to flood protection, the nature of permissive powers and their responsibilities as individuals or as riparian land and property owners (see (vi), Section 2.5.1). This highlights the need for better communication and importance of providing consistent messages about FRM. Linked to this, flood risk professionals in Defra, LAs and the EA expressed concern that the technical language used in FRM incites the wrong connotations; for instance, property-level protection measures give the impression of absolute flood protection.

2015 outlined funding arrangements to support LLFAs in their new role as statutory consultees for planning applications for major developments with SUDS implications.

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- Flood events can become politicised through actor coalitions and the media. In the case of the Winter 2013/14 floods this resulted in political knee-jerk reactions to fund dredging in the Somerset Levels. This not only contradicted national policy and went against expert advice, but also set a precedent that cannot be sustained. This creates conflicts between societal expectations and flood risk management policy (see (viii), Section 2.5.1).

8 Recommendations for strengthening flood risk governance in England

This research has involved an extensive analysis of English flood risk governance in its entirety and corresponding impact on the delivery of flood risk management. This has involved a comprehensive review of policy and legal documents, dating back to the 1930s in some cases. Furthermore, 61 interviews and two workshops involving past and current flood risk professionals, as well as academic experts, have informed this analysis. Looking to the past, this study has examined the factors driving change and stability in governance in order to fully understand governance dynamics and provide insights into the potential opportunities or constraints to implementing future changes in governance. In-depth evaluation of the efficiency and legitimacy of flood risk governance and its role in enhancing societal resilience to flooding, has also highlighted key strengths and weaknesses in the current arrangement (also see Priest *et al.*, 2015). Based on this comprehensive analysis, this Chapter summarises the key recommendations for strengthening flood risk governance in England.

Improving funding for flood defence and mitigation

RECOMMENDATION 1: Enhancing the capacity to resist flooding requires *both* a long-term commitment of capital and revenue spending to support new projects and the maintenance of existing assets. There is a perceived inequality between capital and revenue budgets, leading to the fear that there will be a growth in the number of new projects whilst existing lines of defence fall into disrepair (see (ii), Section 2.5.1 and Chapter 7). In response, a total expenditure classification has been called for (ASC, 2014; Efra Committee, 2015). However, a merger of the two budgets could create difficulties in monitoring capital and revenue spend; therefore, rather than amalgamating the two, this research recommends that allocations are at least considered over the same time period. A coinciding six year programme for maintaining existing assets is recommended. In line with Partnership Funding, different sources of public and private funding should be considered to maintain standards of flood protection.

AMENDMENT: Since the time of data collection and analysis the Treasury has released the *Spending Review and Autumn Statement 2015*, which protects the budget for defence maintenance until 2021 (HM Treasury, 2015). This is an important step-forward in securing revenue for asset maintenance in the medium-term. We recommend the continuation or extension of the 6 year spending programme (once the current Investment Plan is delivered in 2021), which gives equal consideration to capital and revenue funding from the outset.

RECOMMENDATION 2: Partnership Funding holds significant potential to increase the number of defence and mitigation projects developed by diversifying funding sources and creating risk-sharing arrangements between the public and private sectors and civil society. Early evaluation of Partnership Funding suggests that it has successfully enabled projects that would otherwise not been eligible for Grant-in-Aid to develop through partnership funding arrangements (Defra, 2014c). There has been a clear diversification of funding sources; however 75% of funding contributions continue to come from the public sector and concerns are growing about the amount that can be realistically

expected from private sector contributions (Efra, 2015; see (x), Section 2.5.2). There is a need to establish a strategy to incentivise the private sector, in case the anticipated funding from the private sector falls short. This strategy should take into account the different interests and motivations (e.g. beneficiary, branding and notion of corporate responsibility) and consider different types of incentives. Further research is required to better understand the factors that motivate or dissuade different types of private sector organisations to invest in FCERM.

RECOMMENDATION 3: Continued alignment of FRM with other policy goals (such as economic development and re-generation), is necessary for diversifying funding sources for FRM activities. However, there is a need to develop methods for performing cross-sectorial Cost-Benefit Analysis to examine these wider benefits and facilitate access to wider funding streams. Whilst there is considerable potential to deliver multiple benefits (e.g. environmental, economic, recreational etc.) through integrated, cross-sectoral Catchment Based Approaches (CaBA), there is a lack of evidence that this approach could lead to significant reductions in flood risk. Therefore, further empirical research is required to demonstrate the potential of CaBA in FRM, to reduce current uncertainties and to develop long-term monitoring techniques (as requested by others e.g. McIntyre and Thorne, 2013).

Addressing flooding through better spatial planning

RECOMMENDATION 4: Continued development on the floodplain continues to be criticised, but in a society where economic development and housing shortages need to be addressed, there is a need to resolve the seeming conflict with FRM. Planning conditions in England (e.g. designated floor heights) and mechanisms to regulate development in flood risk areas (i.e. the sequential and exception tests) are effective, but arguably more is required. Continued development on the floodplain may be unavoidable, but all future development should be adaptively designed to minimise exposure to future risks. Moreover, we cannot ignore the legacy of past decision making or the fact that extensive development has already taken place in areas at flood risk; thus, strategies for ‘retrofitting adaptation’ are required. This can be delivered through two avenues.

Firstly, there is a need to strengthen enforcement mechanisms in spatial planning to ensure that planning decisions taken today do not simply circumvent risks in the future. Risks should not only be passed to homeowners, but those undertaking (and profiting) from development should also retain some responsibility and liability.

Secondly, more needs to be done to integrate and retrofit Sustainable Urban Drainage Systems (SUDS) into urban centres (see (iii), Section 2.5.1). This is largely the responsibility of property owners, such as domestic, commercial and public properties; therefore, incentives for promoting SUDS must be directed at various property owners (CIWEM, 2013). National and local campaigns are required to advertise SUDS options alongside their costs and benefits at the property scale. At a larger scale, CIWEM have called for a government-led ‘green streets’ initiative to promote SUDS retrofitting in urban centres. The creation of ‘SUDS champions’ within Risk Management Authorities could facilitate the delivery of this vision at the local scale. There is a need for both institutions and the public to ‘buy-in’ to the concept of SUDS, this could be facilitated by highlighting cost-savings, benefits to risk reduction, water quality and the urban environment.

Incentivising property-level measures through flood insurance

RECOMMENDATION 5: The Flood Reinsurance scheme (“Flood Re”) is an important stop-gap measure to ensure the availability and affordability of flood insurance. However, formal incentive mechanisms to promote risk reduction measures at the property scale are absent from the new Flood Re scheme and there is an assumption that the transition to risk-reflective pricing in 25 years will incentivise homeowners to invest in such measures in the future. In the meantime, the flood aspect of insurance will be capped for all high risk households and essentially stall this process. Whilst a smooth transition towards risk-reflective pricing is required, there is a need for a long-term strategy for incentivising policyholders to invest in risk reduction measures and promote resilience at the household scale (see (vii) Section 2.5.1). This strategy should include plans to increase risk awareness and clarify how household *flood risk reports* will be rewarded.

Improving resources for local flood risk management

RECOMMENDATION 6: Increasing responsibilities have been placed on Local Authorities at a time where there are significant constraints on resources. In terms of financial resources, there is widespread concern about the impact of budget cuts and council tax freezes on the ability of LAs to deliver critical services and meet statutory functions (Chapter 7). Although a New Burdens Assessment⁶² was delivered by policymakers in April 2015 to support the transition of LLFAs as statutory consultees for planning applications for major developments with SUDS implications, this research reveals a widely-held perception amongst practitioners that financial resources are significantly lacking. Overall funding for Local government was reduced in real terms by 33% between April 2011 and March 2015 (LGA, 2013). Despite the Localism agenda, it seems that the distribution of responsibilities to the local scale has not necessarily corresponded with the distribution of power (Penning-Rowsell and Johnson, 2015). Local Authorities are dependent on the Local Government Settlement and Local Services Support Grant to deliver their FRM responsibilities. This grant is intentionally not ring-fenced so that it can be distributed according to local needs, of which FRM is one of many services that must be delivered. In agreement with England and Knox (2015), there is a need to investigate the possibility of a ring-fenced grant⁶³ for LLFAs to support delivery of FRM responsibilities.

AMENDMENT: Since the time of data collection and analysis, the government has released the *Spending review and Autumn Statement*⁶⁴ 2015, as well as the *Provisional local government finance settlement 2016-2017*⁶⁵, which further establishes the Localism agenda and outlines reforms to local government funding (Box 8.1). These changes will reduce dependency on central government grants and mean that councils will be fully-funded through local sources of revenue. The impact of these funding reforms upon local FRM is an unknown. However, the Settlement protects £30m of funding

⁶² New burdens on Local Authorities (e.g. duties, new powers and targets) must be adequately assessed and funded by relevant Government Departments (DCLG, 2011c).

⁶³ Ring-fenced budgets exist in England and mean that money must be spent on a specified service or activity.

⁶⁴ The Autumn Statement is delivered in November or December each year and provides an update on the government's plans for the economy based on the latest forecasts from the Office for Budget Responsibility (OBR).

⁶⁵ The local government finance settlement is the annual determination of funding to local government.

for LLFAs and £2m for authorities acting as statutory consultees in spatial planning decision-making. Taking these recent changes into account, the recommendation to propose a ring-fenced grant seems unrealistic. Instead, we would like to raise a potential concern that this governance-shift could have in terms of our assessment of legitimacy. The impact of the funding reforms is likely to vary significantly across the country, where some counties are heavily dependent on the government's block grant allocation, whilst others will greatly benefit from the decision to abolish uniform business rates. In turn, this could have serious implications for local investment in FRM activities. Therefore, we recommend that in the transition period for implementing these reforms a formal review process is established to explicitly monitor both positive and negative implications and knock-on effects for FRM spending.

RECOMMENDATION 7: Community engagement is essential for enhancing risk awareness and ownership of risk responsibility at the local scale. However, resource constraints in the LLFAs and the EA constrain the delivery of this essential work. There is therefore a need to increase resources (financial, staffing and skills) to support public engagement activities that are rooted in local concerns in order to enhance sustainability.

Improving communication with the public

RECOMMENDATION 8: There is a need to better manage societal expectations, improve public understanding of flood risk and risk responsibilities, and enhance acceptance of the risk-based, 'living with water' philosophy advocated in flood policy in the pursuit of social, economic and environmentally sustainable FRM (as discussed in (xviii) Section 2.5.3). This is necessary to empower individuals to adopt adaptive behaviours (e.g. implementation of property-level measures) and enhance resilience at the household and community scale (see (vi) and (viii) Section 2.5.1). However, this can be constrained by inconsistencies in risk communication messages provided by different RMAs. Therefore, we recommend that efforts are made, from national to local scales, to establish consistent, user-friendly information about flood risks and FRM across Risk Management Authorities.

These should be echoed by public-facing actors. Indeed, the reactive, political 'knee-jerk' reactions witnessed in the aftermath of the Winter 2013/14 floods (and again in 2015/16) give the wrong impression that the State will always intervene to prevent flooding. This undermines FRM policy and also sets precedents that cannot be sustained. Public-facing actors and politicians should provide greater support for the FRM approach adopted in England, especially given the considerable strengths and examples of best practice embedded within it.

Post-data collection: Recent changes to flood risk management in England

Since the time of data collection and analysis a number of important changes and events have taken place. These are summarised in Box 8.1. Although these changes highlight the dynamic nature of flood risk governance in England, the reader should bear in mind that these have not been incorporated within the analysis presented in this report. This report provides a comprehensive analysis of flood risk governance from 1930 to September 2015.

Box 8.1: Summary of recent changes and events in England that have occurred post-data collection and analysis (as of February 2016)

- Significant flooding in Winter 2015/16 in Northern England attributed to Storm Desmond and Storm Eva, sparking renewed-attention into the national Flood and Coastal Erosion Risk Management Strategy (FCERM) (Defra/EA, 2011) and state of affairs of national flood defences.
- Government establishes a *Communities and Business Recovery Scheme* to provide financial support to those affected by the Winter 2015/16 floods. The scheme was administered via the Local Authority, amounting to ca. £500 (€642) per household.
- *Household Flood Resilience Grant Scheme* is launched for those affected by the winter storms (including business properties), with grants available up to £5000 (€6,418) to adapt affected properties.
- Farmers were invited to apply for *Farming Recovery Fund* grants available via the Rural Payments Agency, to help restored farmland affected by the winter storms and recover from uninsurable losses.
- Government launched a campaign to promote tourism in Northern England following the recent flooding, alongside £2m of funding to repair infrastructure across the Lake District National Park.
- The Environment Secretary announced that the EU Farm Fund (Pillar II) will be used to incentivise flood storage on privately-owned land.
- Launch of a *National Flood Resilience Review* to assess how England can be better prepared for flooding and extreme events. The review will focus, in the first instance, on 4 key areas – 1) updating climate modelling and stress-testing national resilience to flood risk; 2) assessing the resilience of critical infrastructure; 3) temporary flood defences; and 4) future investment strategy.
- Flood Re publishes its first *Transition Plan* to outline how the Scheme will manage the transition to a market with risk-reflective pricing. The Scheme will commence from April 2016, subject to approval from financial regulators.
- Reforms to the Legal Aid system, which would have reduced access to legal advice and representation for those unable to afford it, have since been dropped by the Justice Secretary. This should minimise the threat to procedural equity discussed in this report.
- Ciria has published an updated SuDS manual to assist in the planning, design, construction, management and maintenance of SuDS (Woods Ballard et al., 2015)
- HM Treasury released the *Spending review and Autumn Statement 2015*, which protects flood defence maintenance funding until 2021.
- The *Provisional local government finance settlement 2016 to 2017* was delivered in December 2015. The settlement outlines radical changes to funding for local government to reduce dependence on central government grants. By 2020 it is anticipated that councils will be fully-funded by council tax, business rates and other local revenues. Uniform business rates will be abolished, meaning that councils will be able to set local business rates to encourage economic activity and retain 100% of this revenue by 2020 to support local services. The impact of these funding reforms upon local FRM (as well as other public services) is an unknown. However, the Settlement protects £30m funding for LLFAs and £2m for authorities acting as statutory consultees in spatial planning decision-making.

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Annex

Table A1: List of interviewees

Position	Relevant sub-governance arrangement	Date of interview
National-level interviewees		
Planning Advisory Service	Planning	17.07.2014
ex-Head of Flooding, Coastal Erosion and Water Branch, Planning Directorate, DCLG	Planning	03.12.2014
GLA Group Finance Manager, Resources Directorate, Greater London Authority	Planning; Bellwin; LA insurance	01.12.2014
Senior Advisor, Planning, Housing and Environmental Assessment Environment Agency	Planning	18.02.2015
Senior lawyer FCERM, Environment Agency	Defence and Mitigation	11.02.2015
Committee on climate change; ex-Defra (partnership funding)	Defence and Mitigation	28.01.2015
EA/FFC Senior advisor for monitoring and forecasting	Flood forecasting and warning	13.02.2015
Met Office / FFC Strategy and development coordinator	Flood forecasting and warning	27.01.2015
Cabinet Office - Policy manager CCS	Emergency management	18.02.2015
Chief fire officer Hertfordshire; CFOA operations director	Emergency management	29.01.2015
National flood resilience manager, EA	Emergency management	06.02.2015
Responsible for Bellwin and Bellwin review process, DCLG	Bellwin	16.10.2014
Local Government Association	Bellwin; LA insurance	27.11.2014
Association of British Insurers	Insurance	11.12.2014
Head of Claims, AXA insurance	Insurance	11.12.2014
Zurich Municipal	Insurance (LA insurance specifically)	09.02.2015
Property lawyer, Practical Law	Legal, Development, Planning	20.11.2014
Ex-Deputy Director of Flood and Coastal Policy, Environment Agency	Multiple	25.11.2014
Water policy, Royal Society for the Protection of Birds	Multiple	12.02.2015
Local Wraybury resident and flood activist	Semi-autonomous flood risk governance	26.11.2014
Chief Executive, National Flood Forum (strategy and policy focus)	Semi-autonomous flood risk governance	22.01.2015
Local resilience flood team, Defra	Semi-autonomous flood risk governance	23.01.2015
FCERM senior advisor, Environment Agency	Semi-autonomous flood risk governance	19.02.2015
Research scientist, local flood risk, Environment Agency	Semi-autonomous flood risk governance	23.01.2015
EA local level community work (Communities at Risk)	Semi-autonomous flood risk governance	12.03.2015
St Blazey Flood Action Group and Cornwall Community Flood Forum	Semi-autonomous flood risk governance	09.03.2015
Communities Director, National Flood Forum (local level community focus)	Semi-autonomous flood risk governance	18.03.2015
Liverpool Woodlands Estate – Netherley, Member/co-ordinator of Flood Action Group	Semi-autonomous flood risk governance	11.03.2015

Position	Relevant sub-governance arrangement	Date of interview
Leeds (Garforth) Flood Action Group co-ordinator	Semi-autonomous flood risk governance	23.03.2015

Position	Relevant sub-governance arrangement	Date of interview
Hull case study		
ERYC - Flood risk manager; Managing ERYC Derringham flood alleviation scheme	Defence and mitigation	27.05.2014
HCC - City planning manager	Defence and mitigation; planning	28.05.2014
ERYC - Senior flood risk strategy and policy officer	Defence and mitigation	27.05.2014
ERYC - Project manager FRM (operational/delivery), ERYC; senior engineer, flood and coastal risk management	Defence and mitigation	28.05.2014
Former EA - Senior advisor, Yorkshire (North and East) partnerships and strategic overview team. Now HCC as flood risk manager.	Defence and mitigation	28.05.2014 and 19.11.2014
Grontmij - Technical Manager and FRM consultant	Defence and mitigation	27.10.2014
Former HCC - flood risk manager	Defence and mitigation	07.11.2014
Humber emergency planning service - emergency planning manager	Emergency management	26.11.2014
Yorkshire Water - flood strategy manager	Defence and mitigation	15.12.2014
ERYC - Principal Valuation & Disposal Surveyor (involved in negotiation for WaDFAS)	Defence and mitigation	21.11.2014
LEP - Executive Director (Strategic Policy and Business Development)	Defence and mitigation	20.11.2014
ERYC - senior legal officer	Defence and mitigation	11.02.2015

Position	Relevant sub-governance arrangement	Date of interview
Leeds case study		
Leeds City Council - flood risk manager	Defence and mitigation	23.02.2015
Leeds City Council - planning policy officer	Planning	03.02.2015
Yorkshire Water - flood strategy manager	Defence and mitigation	08.04.2015
Environment Agency - Flood risk advisor, Leeds flood risk alleviation scheme; also involved in review of planning applications	Defence and mitigation	15.01.2015 and 03.02.2015
Adaptation sub-committee for the Committee on Climate Change, but also discussed funding for Leeds FAS	Defence and mitigation	28.01.2015

Position	Relevant sub-governance arrangement	Date of interview
Lower Thames case study		
Academic expert , involved in CBAs for both Jubilee River and River Thames Strategy	Multiple	12.08.2014
Academic expert, Professor in Water Economics, involved in CBA for River Thames Scheme	Multiple	12.08.2014
Programme Executive River Thames Scheme, Environment Agency	Defence and mitigation	29.09.2014
Strategic Director, Elmbridge Borough Council	Defence and mitigation	13.11.2014
Head of Sustainability and Leisure, Spelthorne Borough Council.	Defence and mitigation	24.11.2014
Risk & Resilience Manager - Spelthorne Borough Council & Runnymede Borough Council	Emergency management	24.11.2014
Local Wraysbury resident and flood activist	Semi-autonomous flood risk governance	26.11.2014
Assistant Director Highways and Transport Service, Surrey County Council)	Defence and mitigation	10.12.2014
Emergency Planning, Royal Borough of Kingston-upon-Thames	Emergency management	26.11.2014
Wastewater Infrastructure Strategy Manager, Asset Management. Thames Water	Surface water	21.01.2015
Water policy, Royal Society for the Protection of Birds	Multiple	12.02.2015
Planning policy, Royal Borough of Kingston-upon-Thames	Planning	24.10.2014
Planning Officer, Spelthorne Borough Council	Planning	01.12.2014
Planning development decisions in Royal Borough of Kingston-upon-Thames	Planning	01.12.2014
Surface water management consultant to the Royal Borough of Kingston-upon-Thames	Planning	28.10.2014

**Two interviews are not listed for anonymity reasons. In total, 61 interviews were conducted as part of this research. Note that some interviews informed analysis at both the national and case study scale.*

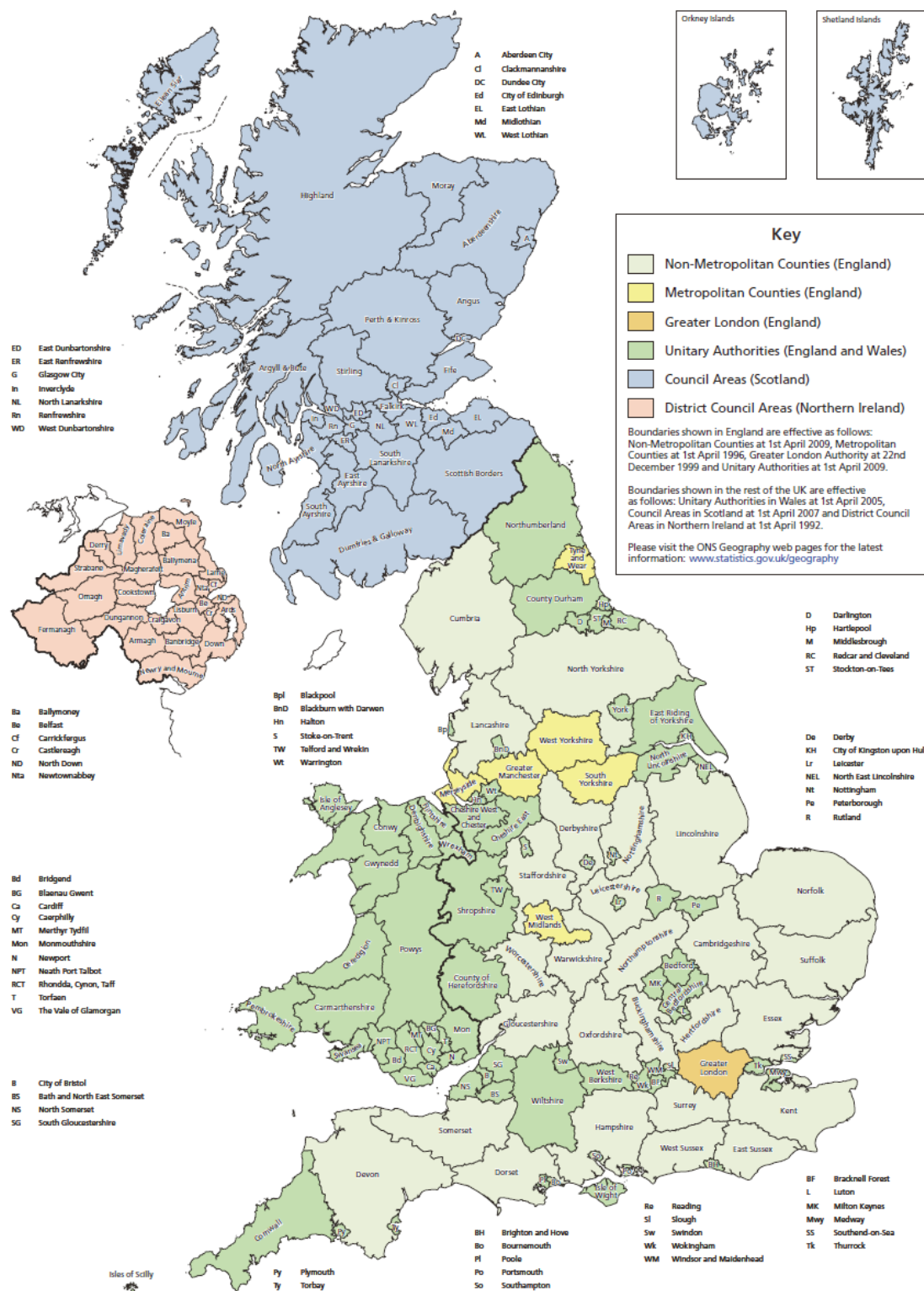


Figure A1: Map of counties and Unitary Authorities in the UK as of 2009 (Source: Office of National Statistics)

Table A2: Evaluation criteria and example indicators (from Alexander *et al.*, 2015)

Desired outcomes of governance	Evaluation criteria	Some example indicators to assess criteria
<p>Societal resilience</p> <p>Resilience is conceptualised in 3 components. The first facet is resistance, which is defined as the ability to prevent flood hazards from occurring, typically through the use of defences. This might be conceptualised at the first line of defence.</p> <p>The next facet of resilience is described as ‘the ability to absorb and recover’ from flood events. Diversity in the arrangement of measures is often seen as advantageous in the literature, because it creates a series of ‘back-ups’ and/or addresses the problem at multiple scales.</p> <p>A third facet of resilience is defined as adaptive capacity – <i>i.e.</i> the capacity to learn, innovate and improve responses to flood risk.</p>	Resistance	The assembly of measures/projects/or governance arrangements is shown to have enhanced the ability of the social-environmental system in terms of reducing the likelihood or magnitude of flood hazard.
	Ability to absorb and recover	The assembly of measures/projects/or governance arrangements is shown to have enhanced the resilience of the social-environmental system in terms of reducing the consequences, enabling the system to absorb and/or quickly recover.
	Ability to adapt	Opportunities for learning and evidence that ‘lessons learned’ are implemented.
<p>Efficiency</p> <p>Efficiency is a desired outcome of flood risk governance and is wide apparent in policy documentation. Ultimately, flood risk governance and FRM should use resources (economic, human, technological) in an efficient manner; based on the ratio of some desired output(s) to input(s).</p>	Economic efficiency	The flood risk governance arrangement or sub-entities of governance (<i>e.g.</i> FRM measures, projects or sub-arrangements) use financial resources in an efficient manner, based on the ratio of desired output(s) to input(s)
	Resource efficiency	Concerns for resource efficiency are widely evident within the flood risk governance arrangement (and delivered activities), as well as within the legal framework and/or are taken into account in amendments and reforms
<p>Legitimacy</p> <p>Ultimately flood risk governance should be conducted in a legitimate way. There is a broad literature base on the concept of legitimacy, from which a range of criteria have been distinguished.</p>	Social equity	The distribution of costs and benefits are fully considered within the decision-making process and communicated to those affected
	Accountability	There are opportunities for stakeholders to challenge decisions that have been made and hold decision-makers accountable
	Transparency	The decision-making process is transparent so all can see how decisions were made (<i>e.g.</i> public inquiries)
	Participation	Stakeholder participation has been sought through various stages in the decision-making process, based on a model of knowledge

Desired outcomes of governance	Evaluation criteria	Some example indicators to assess criteria
		exchange
	Access to information	Stakeholders have equal access to relevant information about the problem and how it will be managed
	Procedural justice	The process of resolving disputes is considered to be fair
	Acceptability	Decisions are accepted by stakeholders

